The complexity of decision-making under social and environmental change: A resilience-based governance framework for Tasmanian coastal areas

by

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Declaration of Originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

Javad Jozaei
7 July 2017

Abstract

Due to the increasing impacts of environmental and anthropogenic drivers, coastal Social-Ecological Systems (SESs) are deteriorating. Scholars argue that the conventional environmental governance and management approaches have not been successful in reversing or slowing down this deterioration. Despite calls for more collaborative and democratic approaches, governance is often hierarchical, inflexible and fails to consider social factors in decision-making processes appropriately. Research suggests that resilience thinking could provide a powerful framework for analysing problems in SESs and guiding the design of reform options.

This research aimed to examine the utility of a resilience thinking framework to analyse and improve environmental governance, using Tasmanian coastal areas as a case study. The objectives of the analysis were to: (i) establish requirements for effective coastal governance, as informed by resilience thinking and governance theory; (ii) identify influential organisations, taking into account interactions across scales; (iii) identify the attributes of resilience capacity (both adaptational and transformational); (iv) evaluate Tasmanian coastal governance against these attributes and identify potentially useful reform options; (v) reflect on the power and the utility of resilience thinking for informing the design of effective and responsive coastal governance; and (vi) draw out implications for the design of resilience coastal governance regimes beyond the case study area.

This thesis adopted a mixed method approach involving literature review, case study, an online survey and semi-structured interviews with key case study stakeholders. Triangulation of evidence from these multiple sources generated robust findings in relation to each of the objectives.

Resilience thinking (and the embedded SES concept) was identified as a potentially suitable framework to address the complexity of coastal SES under conditions of uncertainty. In addition, governance was recognised as providing an essential means of identifying and negotiating diverse values and interests, including ecological, social, economic and political considerations. Sixteen key attributes that constitute resilience capacity were identified from an analysis of the literature. These attributes encompassed the fundamental features

of resilience thinking and good governance including panarchy, adaptive cycle, stakeholder engagement, flexibility, polycentricity and leadership.

From the online survey, stakeholders considered all sixteen attributes to be important in developing resilience-based governance for the case study area. However, survey and interviews identified a low level of resilience capacity across the entire governance system. At the national level, only knowledge management processes, diversity of expertise and knowledge sharing mechanisms were contributing to resilience capacity, with the rest of the attributes insufficiently developed to support any level of resilience. The performance was similarly poor at the Tasmanian State level, with leadership, adaptive planning, institutional flexibility and a supportive legislation framework at critically low capacity. Inter-organisational attributes such as organisational coordination also required significant improvement. In contrast, a regional natural resource management body and two coastal local governments were supporting an adequate resilience capacity, particularly with respect to leadership, transparent decision-making, stakeholder engagement, organisational learning, knowledge sharing mechanisms and flexibility.

Barriers to establishing resilience-based Tasmanian coastal governance included lack of supportive political leadership, poorly developed and fragmented policy and planning frameworks, and inadequate inter-sectoral and cross-scale communication and collaboration. Reform options were proposed to improve resilience-based Tasmanian coastal governance, structured under interrelated themes including panarchy and adaptive cycle; leadership; knowledge systems and adaptive learning; and public awareness and engagement.

The findings confirmed the power and utility of resilience thinking and the sixteen attributes of resilience capacity as an overarching framework for analysing complex coastal SESs. A comparison between the Tasmanian coastal SES and issues facing coastal areas in the US and Europe showed that it is likely that many of the reform options proposed in this research could address governance problems in other developed country contexts.

Dedications

To Hannah (Saideh) and Artin, whom without their love and support, this journey would have been unbearable.

To Uncle Henrik for being my life coach and showing how professionalism and morality could sit together.

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Chapter 1. **Introduction**

1.1. Global change, coastal areas and wicked problems

Coastal areas are transition spaces that connect land and marine ecosystems. The interactions between land and sea make the coastal area a significant place regarding ecological, social, economic, cultural, and political concerns. Fisheries and aquaculture, tourism and recreation, shipping and trade, as well as biodiversity conservation, are among the significant values of coastal areas. Around 14 per cent of ocean production originates from coastal waters which cover only 8 per cent of the ocean surface and less than 5 per cent of the volume (Harvey & Caton 2003).

In addition, the adjacent terrestrial area is home to around 40 per cent of the world's population that create enormous social and environmental challenges for the coastal zone (Duxbury & Dickinson 2007; Nobre 2011). Costanza (2014) estimated that the productivity of coastal ecosystems (including estuaries, seagrass beds, coral reefs and shelfs) is approximately 39 trillion US$ per year. Pendleton et al (2016) argued that due to resource deterioration, the productivity of coastal ecosystems is decreasing. Coasts play an important role in safeguarding coastal societies and their properties by providing a buffer zone against coastal hazards. Ecosystem services such as water filtration, regulation of water flows, the provision of food and cultural benefits are other important values of coastal areas.

Like many other places on Earth, coastal areas are influenced by social and environmental drivers of change such as sea level rise, coastal inundation, erosion, population growth, human development, overfishing and climate change (Kay & Alder 2005; Moser et al. 2012; Nobre 2011; Valiela 2006). Scholars argue that due to high levels of environmental and anthropogenic disturbances, coastal systems are deteriorating (Beatley et al. 2002). Balancing relations between human and natural systems is a major problem in coastal planning and management (Duxbury & Dickinson 2007; Nobre 2011; Wescott 2012). Issues such as insufficient knowledge, inappropriate human development, the complexity of social-ecological systems, and uncertainties associated with social and environmental drivers create challenges for effective coastal planning and management (Craig & Ruhl 2010; Kay & Alder 2005; Nobre 2011).

Strategies and programs to address coastal problems include integrated coastal zone management plans, shoreline management plans, marine spatial planning and ecosystem-based management plans. For example, Coastal Zone Management (CZM) emerged in the 1970s and was followed by Integrated Coastal Zone Management (ICZM) in the early 1990s (Harvey & Caton 2003). By developing these instruments, coastal policy-makers, planners and managers attempted to tackle a range of coastal problems on national and international scales (Harvey & Caton 2003; Thissen 2010).

Despite all these attempts, scholars argue that the conventional frameworks, approaches and instruments have not been successful in reversing or slowing down the increasing deterioration of coastal systems (Craig & Ruhl 2010; Duxbury & Dickinson 2007; Janssen & Ostrom 2006). For example, Craig and Ruhl (2010) argue that due to the inherent complexity of coastal systems, acquiring detailed scientific knowledge and information about coastal social and ecological systems is not possible. Thus, relying on merely scientific methods to respond to coastal problems is not effective and could be misleading (Craig & Ruhl 2010).

Walker and Salt (2006) indicate that application of traditional command and control and top-down approaches are the major reasons for the ineffectiveness of coastal planning and management. Traditional approaches to coastal planning and management fail to appropriately address the interrelations between natural and social systems (Janssen & Ostrom 2006). In this regard, Moser et al. (2012, p. 69) indicate that "transformative changes in science and in practice are required for remaining alert to unsuspected problems and unimagined solutions that may well come, and thus for continued safe and prosperous occupation of land's end". Sutton-Grier et al. (2015) argue that "hybrid approaches" that integrate natural and human based strategies can improve coastal resilience.

Many environmental and coastal problems are considered as "wicked" problems (Harris et al. 2010; Rittel & Webber 1973). Wicked problems are characterised as uncertain, complex, trans-disciplinary and transboundary (Harris et al. 2010; Lockwood et al. 2010; Rittel & Webber 1973). Because of their nature, dealing with wicked problems is one of the major concerns in environmental and natural resource management (Harris et al. 2010; Moser et al. 2012). There are no formulated and prescriptive responses to tackle wicked problems.

Coastal planning and management systems should, therefore, adopt flexible, adaptive and dynamic response strategies (Harris et al. 2010; Rittel & Webber 1973).

Increasing uncertainty and unpredictability of drivers of change hinder the development of effective responses to deal with coastal problems (Harris et al. 2010; Moser et al. 2012). Also, the inherent complexity and dynamic of coastal social and ecological systems increase the level and influence of uncertainty. Thus, scholars argue that human knowledge is insufficient to overcome the increasing level of uncertainty embedded in rapid drivers of changes and complexity of social and ecological systems (Berkes 2007).

Attempts to reduce the impacts of uncertainty on natural and human systems could potentially consider two options. One option focuses on developing tools for better prediction of change and uncertainty. Another option emphasises increasing the resilience of the social and ecological systems by improving their capacity to deal with uncertain changes (Berkes 2007). The latter option, which is the focus of this research, requires incorporation of appropriate frameworks or approaches that could embrace the influence of drivers of change and uncertainty, and complexity of natural and human systems (Walker & Salt 2006).

Incorporating a framework that appreciates systems complexity, acknowledges change and uncertainty and enhances cross-scale interaction is seen as a potential response to establishing effective coastal planning and management systems (Berwick 2007; Duxbury & Dickinson 2007; Hopkins et al. 2011). Thissen (2010) indicates that a responsive coastal planning and management system should consider an appropriate combination of frameworks, approaches and instruments. Furthermore, multiple stakeholder interests, cross-scale interactions and scale mismatches problems (for example, interactions between local, regional, state and national scale interests), and complexity and uncertainty of coastal systems should be considered in the process of coastal decision-making and policy development (Thissen 2010).

1.2. Tasmanian coastal areas

Australia has a 60,000-kilometre coastline that extends from the tropical seas of the north to the sub-Antarctic waters of the Southern Ocean. The coast includes valuable and iconic coastal features such as mangroves, salt marshes, seagrass beds, beaches, estuaries, coral reefs, and wetlands. Coastal zones provide many benefits to its inhabitants and visitors. It is a source of food, recreation and a range of industries such as minerals and energy that contribute to the Australian economy. Moreover, almost 85 per cent of Australia's population inhabits coastal areas (Australian Government 2011b; Short & Woodroffe 2009).

The Australian Government (2011b) indicates that drivers such as climate change, sea level rise and population growth are the main threats to the Australian coastal systems. The report emphasises that the impacts of these drivers on coastal social and ecological systems, and the potentially associated responses are not appropriately addressed in the Australian decision-making and policy development systems (Australian Government 2011b). In addition, the report indicates that in comparison with other countries, Australian coastal planning and management system have a low capacity to deal with the impacts of climate change and sea level rise (Australian Government 2011b).

Tasmania, as an Australian island state, has more coastline per unit land area than any mainland state. The coastal zone supports a wide range of activities including: commercial and recreational fishing, tourism, recreation, urban development and aquaculture. Around 75 per cent of the Tasmanian population lives in the coastal zone (Australian Government 2009). More than 25 per cent of the area of Tasmania is below the high-water mark, and a third of the State's jurisdiction is comprised of estuarine, coastal and marine areas.

Like other parts of Australia, Tasmania's coastal and marine area is subject to multiple environmental and social threats such as climate change, human development, and lack of effective planning and management framework (Lockwood et al. 2012; Prahalad & Kriwoken 2010). Also, stakeholders with a diverse range of values and interests interact on multiple scales. These interactions are complex, dynamic and change over time and across scales. This complexity and dynamism need to be accommodated in processes of coastal decision-making, policy development, planning and management.

1.3. Research aim and objectives

The research aims to inform the development of a resilience-based Tasmanian coastal governance arrangement. The focus of the analysis will be on evaluating the resilience capacity of the Tasmanian coastal governance, identifying the features of an effective and responsive arrangement that supports adaptational and transformational decision-making, and indicating the requirements for establishing such a structure. To fulfil this aim, the following objectives will be addressed:

1- To establish requirements for an effective and responsive coastal governance arrangement, as informed by resilience thinking, governance theory and multi-level interactions between coastal actors

2- To identify influential organisations, taking into account the interactions across scales

3- To evaluate the resilience capacity (both adaptational and transformational) of the case study coastal governance system, identify its attributes, analyse its features and identify its strengths, weaknesses and barriers to improvement

4- To reflect on the power and the utility of resilience thinking for informing the design of an effective and responsive coastal governance regime

5- To develop and assess potentially useful reform options that inform the development of coastal governance arrangements that are likely to enhance resilience capacity of the case study governance system

6- To draw out implications for the design of resilience coastal governance regimes beyond the selected case study area.

1.4. Research structure

The purpose of this thesis is to deliver a rich and interdisciplinary understanding of the current Tasmanian coastal social and ecological systems and associated governance arrangements. The research aims to provide a pathway towards more effective coastal decision-making, policy development, planning and management systems in the era of rapid

change and high uncertainty. The study is structured into eight chapters. Chapter 2 describes research methodology, including the research paradigm(s), methodological framework and selection of methods that include an online survey and key informant interviews.

Chapter 3 first reviews the literature on conventional approaches in environmental and natural resource management. The chapter argues why technocratic and simplistic approaches are not adequate to address the features of complex coastal systems. The chapter then introduces the features and characteristics of resilience thinking and Social-Ecological System (SES) frameworks. In addition, the chapter addresses the requirements for good coastal governance arrangement and draws out the features of a potentially useful framework to deal with coastal social-ecological complexity and dynamics.

Chapter 4 provides a general understanding of the components and the dynamics of the current Tasmanian coastal governance regime in the context of an Australian federal political system. The institutional arrangements and the legislation, policy and planning frameworks influencing Tasmanian coastal governance are addressed in this chapter. In this regard, the organisations that can exert influence over Tasmanian coastal governance are identified, and the tools and instrument they deploy are described.

Chapter 5 provides an analysis of the online survey data. This chapter details the views of participants regarding the effectiveness of the current Tasmanian coastal governance system and the attributes required to develop arrangements that are more responsive. Chapter 6 presents the results of the interview analysis. Particular attention is given to the interpretations and understandings of resilience thinking in the case study area, and the capacity attributes required to incorporate resilience thinking into Tasmanian coastal governance.

Chapter 7 discusses the significance of the research. The chapter argues in support of the power and utility of incorporating a resilience thinking framework into Tasmanian coastal governance, suggests a series of reform options that could inform the development of a resilience-based Tasmanian coastal governance, and indicates the implications of the

proposed arrangements beyond the case study area. Finally, Chapter 8 summarises the contributions of the thesis and provides recommendations for future research.

Chapter 2. **Research methodology**

This chapter will discuss the methodological procedure of the research and explain the research paradigm, theoretical approaches, and methods adopted. The chapter commences with an explanation of qualitative research design. This is followed by a general discussion on conventional methodological approaches and the potential suitable theoretical perspectives for this thesis. Finally, the methods used to collect data on the Tasmanian case study to address the research objectives indicated in Section 1.3 will be introduced.

2.1. Theoretical paradigms of the research

Guba and Lincoln (1994, p. 108) define a research paradigm (or theoretical perspective) as "basic belief systems based on ontological, epistemological and methodological assumptions". A research paradigm should address issues associated with the nature of the reality and the foundations of its existence (ontology); the definitions of a phenomenon and its association with the knower and the type of knowledge required to know it (epistemology); and the methodological procedure of the research which indicate ways of acquiring valid and adequate knowledge and information (methodology) (Denzin & Lincoln 2005; Guba & Lincoln 1994; Yin 2011).

Guba and Lincoln (1994) argue that there are four major theoretical "paradigms" including: positivism, post-positivism, critical theory and constructivism (Table 2.1). Also, Gubrium and Holstein (1997) state that there are four main research "models": naturalism, emotionalism, ethnomethodology and post-modernism. Each of these models has their roots in different ontological and epistemological viewpoints. For example, scholars argue that postmodernism critiques the relations of power and authority on the representation of knowledge and truth (Gubrium & Holstein 1997; Silverman & Marvasti 2008). Although ontology and epistemology have different and distinguishable underpinnings, their categorisation and applications in a social research context tend to overlap.

Table 2.1. Research paradigms and related ontological, epistemological and methodological underpinnings

	Positivism	Post-positivism	Critical theory	Constructivism
Ontology	Naive realism - "real" reality but, apprehendable	Critical realism- "real" reality but not only imperfectly and probabilistically apprehendable	Historical realism- virtual reality shaped by social, political, cultural, economic, ethnic and gender values; crystallized over time	Relativism- local and specific constructed realities
Epistemology	Dualistic/objectivist; finding truth	Modified dualistic/ objectivist; critical tradition/community; finding probably true	Transactional/ subjectivist; value mediated findings	Transactional/ subjectivists; created findings
Methodology	Excremental/manipulative; verification of hypothesis, chiefly quantitative methods	Modified experimental/manipulative; Critical multiplism; falsification of hypotheses; may include qualitative methods	Dialogic/dialectical	Hermeneutical/dialectical

Source: Guba and Lincoln (1994, p. 109)

The selection of an appropriate research paradigm is a fundamental issue for every research project. It influences the design, structure and procedure of the research as well as the credibility and legitimacy of the results (Denzin & Lincoln 2011; Mills et al. 2008). Applying a particular ontological paradigm influences the epistemological approaches, methodological procedures and data collection methods (Gray 2004). For example, a positivist paradigm emphasises the existence of a single reality and the role of the researcher to discover it (Denzin & Lincoln 2011; Gray 2004). Consequently, this ontological viewpoint could lead to an objectivist epistemology, a deductive reasoning system, an experimental methodology, quantitative data collection methods, and a scientific fashion of reporting the findings (Denzin & Lincoln 2011; Gray 2004).

On the other hand, a constructivism theory, as an anti-positivist perspective, addresses the existence of multiple realities and relativity of facts and truth (Denzin & Lincoln 2005). This perception is constructed by the different values and diversity of understandings of a multi-dimension complex social system (Gray 2004; Guba & Lincoln 1994). This ontological

perspective could result in an interpretivist epistemology, hermeneutic methodology[1] and narrative/interpretive form of reporting the results (Denzin & Lincoln 2011; Gray 2004).

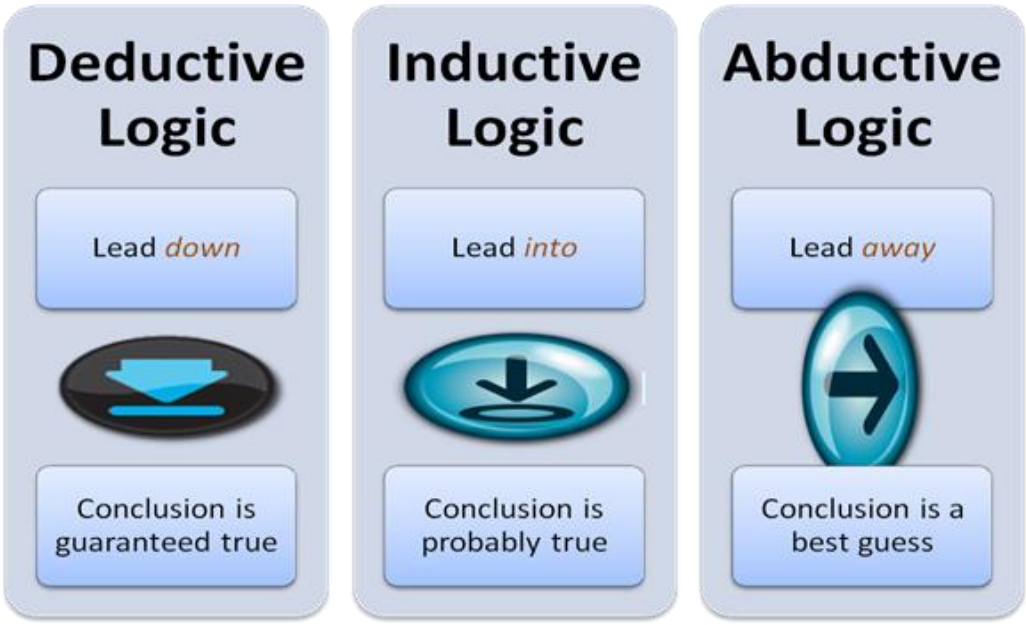
A research reasoning system (or logical system) is another important consideration in quantitative and qualitative research. Three primary forms of research reasoning systems include: deductive, inductive, and abductive (Figure 2.1). Deductive approach generally refers to a 'top-down' procedure of validating and testing a theory, often through quantitative approaches (Gray 2004; Silverman 2009). Deductive reasoning is factual based and is mostly used in a realistic and positivist hard-science context to discover or create fact (Babbie 2013).

Inductive reasoning is generally used to create or develop a concept, a model or theory. In this reasoning approach, the researcher studies the pattern of processes, trends of interpretations and creation of meanings through a systematic process of data collection and observation. In this respect, the researcher develops the best conclusions, models or theories that explain the studied phenomena (Arthur 1994; Bryman 2015). Inductive approach is the main reasoning system in a qualitative research and assists delivering the best interpretation and understanding of a qualitative phenomenon (Bryman 2015).

Also, abductive reasoning offers the best (but not an exact) explanation of a phenomenon when the data and information are incomplete (Thagard & Shelley 1997; Walton 2014). So, the abductive approach could be adopted in a qualitative research when there are lack of data, evidence and observations (Bryman 2015). Although an abductive approach delivers the most likely explanation for an unknown phenomenon, the precision and accuracy of explanation are not certain (Thagard & Shelley 1997; Walton 2014).

[1]-Hermeneutic, in this context is a methodology of understanding a unknown/complex phenomenon through open dialogue and deep inquiry (Jupp 2006).

Figure 2.1. Research reasoning systems



Source: Butte College (2017)

2.2. Qualitative and qualitative research

Choosing a qualitative or quantitative research design depends on the research topic and the philosophical, ontological and epistemological viewpoints of the researcher. Quantitative research is associated with the hard-science factual-based interpretation of reality within the realism and positivism ontologies (Newman & Benz 1998). On the other hand, qualitative research has its roots in constructivism, and interpretivism thinking, found mainly in the social sciences (Bryman 2015; Newman & Benz 1998).

Given (2008, p. 713) argues that quantitative research "refers to approaches to the empirical inquiry that collect, analyse, and display data in numerical rather than narrative form". Quantitative research is a type of investigation that aims typically to discover a fact, or test a theory by collecting concrete evidence and numerical data (Bryman 2015). The process of quantitative research is mainly linear, and the presentation of data and information is mostly in the form of statistical and numerical facts (Bryman 2015; Yin 2011). Quantitative research usually adopts a deductive theory, testing procedures and attempts to discover relations and connections between parameters (Bryman 2015; Given 2008).

Qualitative research design emerged in the early 1900s as a response to the drawbacks of the dominant quantitative methodologies at that time (Denzin & Lincoln 2005; Minichiello &

Kottler 2009). The literature of qualitative research advanced and became popular after the 1970s (Preissle 2006). Due to the interdisciplinary, interpretive and challenging nature, qualitative research design is complex and hard to define (Denzin & Lincoln 2005; Yin 2011). The Sage Dictionary of Social Research Methods defines qualitative research as: "research that investigates aspects of social life which are not amenable to quantitative measurement. Due to the associated with a variety of theoretical perspectives, qualitative research uses a range of methods to focus on the meanings and interpretation of social phenomena and social processes in the particular contexts in which they occur" (Jupp 2006, p. 248).

Qualitative research attempts to deal with the problem of "complexity" rather than "complicatedness" (Robinson 1998). While quantitative research mainly refers to measuring a phenomenon or an object by numerical and statistical methods, qualitative research aims to evaluate different interpretations and perceptions of complex phenomena (Denzin & Lincoln 2005; Robinson 1998; Winchester 2005). Qualitative research can obtain first-hand knowledge and new insights from different perspectives and through a variety of instruments (Minichiello & Kottler 2009; Yin 2011).

Minichiello and Kottler (2009) and Yin (2011) argue several advantages of qualitative research in social science. In this respect, qualitative methodologies can deliver a good understanding of a poorly understood phenomenon, establish basic theories to explain the behaviour a complex phenomenon, evaluate the interactions of a focal system with other systems across scales, represent both collective and personal understandings about a particular subject, offer new rationales for analysis of a phenomenon; and enhance the communications between different interacting spheres including research, implementation and society (Minichiello & Kottler 2009; Yin 2011). Table 2.2 compares different features of qualitative and quantitative research.

Mason (2002) argues that qualitative research should be systematic, accountable, strategically conducted and reflexive. Like quantitative research, a qualitative approach is methodical, but the procedure of data collection and generation is more flexible (Mason 2002). Minichiello and Kottler (2009) state that qualitative research is mainly inductive, flexible, communicative and innovative. Also, qualitative research is hermeneutic, practical, experimental and context-dependent (Stake 2010).

Table 2.2. A comparison between the features of qualitative and quantitative research

	Qualitative	Quantitative
Conceptual framework	Concerned with understanding people's experiences from the perspective of the participant	Concerned with discovering facts in terms of casual-effect
Assumptions	Assumed a dynamic and negotiated reality	Assumes a fixed and measurable reality
Reasoning processes	Inductive (from specific to general) and circular, alternative back and forth between data, analysis, and literature	Deductive (from general to specific) and linear, operating in sequential series of progressive steps
Methodology	Data collected through observation of what is happening in the real world, or talking with people in a conversational style	Data collected by measuring things via instruments or respondent to questions
Participant role	Active informant about their experiences and perceptions	Subject of experiments or respondent to questions
Primary tools	Interviews, focus groups, observation, review of documents	Structured questionnaires, predominated measurement devices, or tools to collect and measure data
Sampling	Small, strategic samples not presumed to represent population	Large samples, randomly selected, presumed to present larger groups
Data analysis	Data reported in words or texts, analysed by theme	Data reported via numerical values and then statistically analysed
Data classification	Coded and classified into themes and concepts	Classified by variables
outcomes	Propositions developed that synthesise theme and lead to rich descriptions, models, and theories	Hypotheses tested between independent and dependent variable

Source: Minichiello and Kottler (2009, p. 19)

2.3. Methodology

Research methodology is a general and systematic procedure to study a research topic (Babbie 2013; Silverman & Marvasti 2008). Babbie (2013, p. 28) argues that "the science of knowing is called epistemology; the science of finding out is called methodology". Adopting an appropriate methodology is important and a challenging part of qualitative research. The selection of methodology is influenced by the ontological and epistemological perspectives of the research (Silverman & Marvasti 2008). Consequently, the choice of the methodology will affect the research methods and techniques (Gray 2004; Mason 2002; Silverman & Marvasti 2008).

In order to adopt the most appropriate methodology, a researcher should study and examine different forms of methodological approaches (Groenewald 2004). To select the appropriate methodological design for this research, a number of methodological approaches, from different epistemological sources were investigated. Table 2.3 shows some of the primary methodological approaches in qualitative social research that are potentially more relevant to the nature of this research.

Table 2.3. Different methodological approaches in qualitative research

	Features	Mechanisms of data collection/analysis	Strengths	Weaknesses	References
Grounded theory	- inductive - forming a new theory to drive a better understanding of a phenomenon - emphasis on bottom-up procedures - no or less availability of pre-existing assumptions/theories	- systematic data collection, analysis and modelling procedure - comparative analysis	- deliver a first-hand and deep understanding of an unknown phenomenon	- time consuming - need high analytical skill - need complex and complicated data analysis instruments - difficult to apply in practice	Yin (2011), Minichiello and Kottler (2009), Robson (2002), Mills et al. (2006, 2008), Babbie (2013)
Phenomenology	- mainly inductive - rely on the participant's opinions and interpretations - mostly consider qualitative data analysis - a major focus is on circumstantial explanations of the phenomenon rather than generalisation - descriptive data presentation	- fairly unstructured - in-depth data collection - a limited number of samples - self-understanding, personal knowledge and self-discovery	- capable of grasping individual interpretations about a phenomenon	- requires complex philosophical knowledge - time consuming - need strong interpretation and analytical skills	Gray (2004), Yin (2011), Minichiello and Kottler (2009),
Case study	- mainly inductive - consider the phenomenon in the real-world context - fairly time-consuming	- in-depth - lengthy data collection	- deliver detailed and descriptive analysis of a phenomenon	- the results are not expandable	Yin (2009); Yin (2011), Minichiello and Kottler (2009)
Action Research, Participatory Action Research (PAR)	- mainly inductive - testing hypothesis/theories - integration of researchers and the research participants - participative and collaborative - emphasis on practicality and seeks solutions - emphasis on recognising required changes, applying the changes and study the outcome	- both quantitative and qualitative methods - structured - employ experimental and control group	- collaborative - acknowledging political and social dimensions of the study	- time consuming - difficult to involve participants - difficult to respond to theoretical problems	Gray (2004), Gobo et al. (2004), Breitbart (2010), Swantz (2001)

2.4. Application of qualitative research in this research

Due to the characteristics and requirements of this study, a qualitative research was identified as the most useful research design. In this research, a qualitative research approach will: facilitate analysing the key concepts of the research such as sustainability, resilience, governance, institutional arrangements and stakeholder values (which mainly have qualitative underpinnings); enable examination of the relations between the multiple actors of the Tasmanian coastal governance across the levels; allow a qualitative assessment of the Tasmanian coastal governance regime; and facilitate analysing of the stakeholders' opinions regarding the requirements for developing an improved coastal governance system.

While the objectivist viewpoint is more compatible with the features of stability theory, linear systems and engineering resilience, the idea of multiple realities in constructivism is a better fit with the existence of multiple stability states and domains of attraction, which are embedded in resilience thinking theory.[2] However, regarding the diversity and complexity of the research ideas, not any single methodological theory can respond to all the requirements of this study.

In this regards, Yin (2011) argues that crafting an "adaptive approach", can assist the researchers to customise the procedure of the research. This adaptive paradigm leads to "a qualitative study that will range from the old-fashioned way of doing qualitative research to a more pragmatic approach that takes advantage of current techniques and tools" (Yin 2011, p. vii). Therefore, this study will adopt an adaptive methodological approach that enhances the flexibility of the research in order to apply a combination of strategies and methods to address the research objectives.

2.5. Research methods

Research methods are "techniques" of systematically acquiring data and information and presenting them (Denzin & Lincoln 2011; Silverman & Marvasti 2008). The choice of methods is mainly influenced by the theoretical research perspectives and the methodological approaches (Bryman 2015; Silverman & Marvasti 2008). However,

[2] These concepts will be explained and scrutinised in Chapter 3.

qualitative research design could employ both qualitative and quantitative data collection methods commonly called a mixed method approach (Silverman & Marvasti 2008). A mixed method approach employs both qualitative and quantitative methods to collect the diverse types of data from diverse sources (Babbie 2013; Bryman 2015; Silverman & Marvasti 2008).

Fielding (2012) argues that a mixed method approach enhances the presentation, richness and validity of the results. He states that "mixed methods potentially offer a depth of qualitative understanding with the reach of quantitative techniques" (Fielding 2012, p. 124). For example, research showed that integration of questionnaire survey with key informant interviews could provide richer and more reliable information to test or develop a theory in a qualitative social research (Bryman 2015; Wajcman & Martin 2002).

Scholars argue that no single method could address all challenges in qualitative research (Winchester 2005). Method triangulation is used to collect a range of data from different sources that can provide robust findings in relation to the questions of interest (Bryman 2015; Fielding 2012). Triangulation enables the researcher to utilise a combination of different methods to address the limitations of a single method, tackle the problem from different perspectives, enhance the credibility of results, and reduce "inappropriate uncertainty about finding the "right answer" (Bryman 2015; Henn et al. 2005; Pierce 2008; Robson 2002).

In this research, a mixed method approach was used to collect both quantitative and qualitative data to respond to the aim and objectives of the research: case study, literature review, online survey, and key informant interviews. Table 2.4 illustrates how each research method addresses the research objectives. The following sections elaborate on each of the methods.

Table 2.4. Relationship between research objectives and methods

Objectives	Methods
To establish requirements for an effective and responsive coastal governance arrangement, as informed by resilience thinking, governance theory and multi-level interactions between coastal actors	literature review, survey, key informant interviews
To identify influential organisations, taking into account the interactions across scales	literature review, case study, survey, key informant interviews
To evaluate the resilience capacity (both adaptational and transformational) of the case study coastal governance system, identify its attributes, analyse its features and identify its strengths, weaknesses and barriers to improvement	survey, case study, key informant interviews
To reflect on the power and the utility of resilience thinking for informing the design of an effective and responsive coastal governance regime	literature review, case study, key informant interviews
To develop and assess potentially useful reform options that inform the development of coastal governance arrangements that are likely to enhance resilience capacity of the case study governance system	literature review, case study, key informant interviews
To draw out implications for the design of resilience coastal governance regimes beyond the selected case study area	literature review, case study

2.5.1. **Case study method**

Case study research is a detailed investigation regarding the complexity of a single place or phenomenon often involving multiple sources of data (Baxter & Jack 2008; Hartley 2004; Stake 1995; Yin 2002). This method is appropriate when a place/phenomenon and its context are strongly interconnected (Yin 2002), and is especially useful for social and organisational studies and for analysing the relations between a focal scale and other scales (Hartley 2004). Identifying the case study and the unit of analysis depends on the research questions and objectives (Baxter & Jack 2008).

Adopting a case study approach is a popular method in qualitative research and has been used by researchers to analyse the interactions between social-ecological systems and regional resilience. For example, Foster (2007) applied case study method to examine regional resilience in Buffalo-Niagara Falls Metropolitan Area in the United States. In the current research, a case study method will be used to analyse the complexity of Tasmanian coastal governance arrangements, and the potential utility of the proposed resilience-based coastal governance system beyond the scope of the case study area.

2.5.2. **Literature review**

A literature review is a method for "analyzing the past to prepare for the future" (Webster & Watson 2002, p. xiii). A literature review delivers a critical examination of the existing data, information and knowledge about the research topic (Bryman 2015). A literature review is considered as a way of gathering information from other people's experiences (Bryman 2015). This method provides the information to rationalise the study and scope the type of information needed for research (Given 2008). In this thesis, an extensive literature review was undertaken to identify the important attributes of developing a desirable coastal governance arrangement and examine the dynamics of the current Tasmanian coastal governance arrangements.

2.5.3. **Survey**

McLafferty (2003, p. 129) argues that the aim of a survey method is "to acquire information about the characteristics, behaviours and attitudes of a population by administering a standardized questionnaire, or survey, to a sample of individuals". In this research, an online survey with quantitative and qualitative questions was employed to evaluate the participants' opinions on the importance of the suggested attributes to form a resilience-based coastal governance system. The primary information acquired from this method assisted to scope the details of the further inquiries in the interview process.

Designing a survey to address various issues at multiple governance levels was a complex procedure. On one hand, the questions should indicate the importance of each attribute in developing the desirable resilience-based coastal governance at different governance levels. These 16 attributes were selected through an extensive literature review. On the other hand, the questions needed to address the regime performance of the attributes for different organisations across multiple scales. Despite this contextual complexity, the survey was intended to be as simple and clear as possible for respondents.

The online survey tool, Survey Monkey, was recognised as a useful means of designing and implementing the survey. A multi-page questionnaire was created in the Survey Monkey environment. Each page of the questionnaire contained a brief explanation of a particular attribute, and a twinned question-set (Appendix 1). In the first question, participants were asked to identify the importance of each attribute in improving resilience capacity at each

governance level. The governance levels were the Australian Government, Tasmanian Government, regional natural resource management (NRM) organisations, and local governments (councils). The six response options ranged from “not important” to “very important” as well as a “do not know/not applicable” option.

The second question asked participants to assess regime performance in relation to the attribute for the indicated organisations. The organisations included the Australian Government-Department of the Environment;[3] Tasmanian Departments of the Premier and Cabinet (DPAC), and Primary Industries, Parks, Water and Environment (DPIPWE); Tasmanian Planning Commission (TPC); NRM South; and Clarence, Huon Valley, and Kingborough Councils. The six response options ranged from “very poor” to “very good” as well as a “do not know/not applicable” option.

Survey participants were selected according to their relevant experience and knowledge and sent an email inviting their participation, a survey information sheet and a link to the online survey. Invitations were made to 250 people from a broad spectrum of stakeholders in Tasmanian coastal areas across all levels and spheres of governance including the national, State, and local governments, regional organisations, academia, the private sector, NGOs, and community groups. A reminder email was sent two weeks after the initial invitation.

Due to factors such as changed email addresses and employment, almost 20% of the invitation emails were undeliverable Out of nearly 200 potential participants, 91 responded to the survey representing a 45% response rate.

In order to analyse the survey responses, the Survey Monkey database was imported into Microsoft Excel. The qualitative answer options (“not important” to “very important” for the importance of the attributes) were translated to numerical values (ranging from 0 to 5 respectively). The mean, mode and standard deviation were calculated for each variable. A set of criteria was established to classify the importance of the variables, as described in Chapter 5.

[3] The name of this organisation subsequently changed to the Department of the Environment and Energy.

2.5.4. **Key informant interviews**

Key informant interviews are a series of in-depth conversations with people who have specific information, knowledge and experience about a topic (Robson 2002). Interviews are used for various reasons: to gather complementary information and fill the knowledge gap when applying other methods are not adequate or applicable, study a complex phenomenon where an in-depth investigation is needed to address different aspects of the complexity, and obtain a diversity of opinions and viewpoints on a subject that is open to diverse interpretations (Dunn 2005).

The process of key informant interviews can be structured, semi-structured or unstructured (Dunn 2005; Robinson 1998). In a structured interview, the questions are predetermined, specific and closed, and the procedure of the interview is mainly under the control of the researcher (Dunn 2005; Robinson 1998). Bryman (2015) argues that due to the influence of the interviewer on the process, a structured interview could be subjected to "systematic bias". In a semi-structured interview, "although the interviewer prepares a list of predetermined questions, semi-structured interviews unfold in a conversational manner offering participants the chance to explore issues they feel are important" (Longhurst 2003, p. 103). Finally, in an unstructured interview, the number of the questions are lower, they are open for long discussion, and the procedure is mostly steered by the interviewees (Dunn 2005; Longhurst 2003).

This study undertook a semi-structured interview design for two main reasons. Firstly, the interview method aimed to provide complementary knowledge and information to validate the survey results. In addition, the interviews aimed to provide in-depth information that could not be possible to be acquired in the survey. This information includes the features of Tasmanian coastal social-ecological systems, barriers to an effective Tasmanian coastal governance regime, and requirements for enhancing resilience capacity of the coastal governance. The semi-structured interviews provided in-depth qualitative details about participants' evaluations of the Tasmanian coastal governance regime and participants' ideas on the features of a desirable coastal governance arrangement, barriers in progressing towards such an arrangement, and requirements for enhancing resilience capacity.

In this regard, 13 questions in four sections were developed (Appendix 2). The first part focused on identifying the influential organisations and the threats and opportunities affecting Tasmanian coastal systems. In the second part, the questions emphasised the definitions of adaptation capacity, the status of Tasmanian coastal in this regard, and the requirements for improving system adaptability. The third part was concerned with transformation capacity and expectations for enhancing transformability. The final section explored the utility and the power of a resilience thinking framework to inform Tasmanian coastal governance design. These questions remained flexible and open-ended to allow adjustment, prompting and probing during each interview.

Selecting the number and variety of key informant participants was a key issue in the research interview process. Gray (2004) argues that because interviewing large numbers can be costly and time-consuming, this method is mainly adopted in small-scale studies. Usually, this “purposeful sampling” is based on the experience and knowledge of potential participants about the research topic. To select the interview participants, attention was given to ensure that the interviewees included people from across governance levels and organisational types (government, academia, the private sector, community and NGOs).

The last question in the survey asked participants to indicate their interest in a follow-up face-to-face interview on the topic. This generated an initial list of 12 potential interviewees. Then, personal contacts were made to invite additional participants to address gaps in governance levels and organisational types. These interview participants were selected from Department of Primary Industries, Parks, Water and Environment (DPIPWE), DPAC, Tasmanian Coastal Adaptation Decision Pathways Projects (TCAP), TPC, local councils (including Clarence, Kingborough an Huon Valley Councils), NRM South; research institutes and academia, NGOs, and local community groups. The selection of local councils (for both the survey and interviews) did not aim to evaluate coastal management capacity at each council. Nor did it aimed to compare the three councils’ performance regarding the effectiveness of their coastal management activities. The three councils were selected to represent local government's influence on and capacity for Tasmanian coastal governance.

Thirty-nine potential participants were shortlisted and contacted through personalised emails or telephone calls. Supplementary interview information was sent with the invitation emails to provide background about key concepts to be discussed in the interview (Appendix 3). In the event, several potential participants did not undertake an interview due to unavailability within the timeframe (August to October 2014), changes in employment, and concern about anonymity and the potential influence of participation on their job security.

Twenty-three interviews were completed representing a response rate of 59 per cent. To preserve the anonymity of the participants during the analysis, each participant was allocated a unique code (Table 2.5). The duration of interview sessions was not limited by the interviewer. Depending on the interest of each participant, the duration of the interviews varied from 45 to 160 minutes. Overall, 1765 minutes of interviews were conducted.

Interview audio files were imported into and transcribed with NVIVO 10 software. After the content of transcriptions was approved by each interviewee, they were thematically coded in NVIVO 10. The themes were developed to identify influential organisations, threats and opportunities affecting Tasmanian coastal systems, the current and desired regime of adaptation and transformation capacities and the utility of resilience thinking framework in coastal governance).

Table 2.5. Affiliations of interview participants

	Participant code	Participant affiliation/field of experience
1	101	NGO/Formerly State Government
2	102	Academia/Researcher/Consultant/state and local level experience
3	103	Private sector/Consultant/ local level experience
4	104	State government /Formerly Federal government
5	105	Private sector/Consultant/Interstate experience/local level experience
6	106	NGO/TCAP/Tasmanian Coastal Alliance
7	107	Regional organisation-NRM
8	108	Local government
9	109	State Government (DPIPWE)
10	110	Academia/Researcher
11	111	State Government (DPIPWE)
12	112	State government (DPAC)
13	113	Academia/Researcher
14	114	Local government
15	115	Local government
16	116	Academia /Researcher
17	117	State Government (DPIPWE)
18	118	Academia/Researcher
19	119	Local government
20	120	Local government/Climate Change expert
21	121	TPC (Intergovernmental organisation)
22	122	Local community/NGO
23	123	State Government (DPAC)

2.6. Ethics approval

All university research projects involving human subjects are required to acquire research ethics approval. The Human Research Ethics Committee of Tasmania examines the ethical considerations in accordance with the requirements of the National Statement on Ethical Conduct in Human Research. An ethics approval form and associated documentation was submitted on 21 May 2014. The ethics application identified the risk associated with acquiring, managing and handling the data and information through both the survey and interview processes. Issues related to monitoring of the processes of survey and interviews, the anonymity of the participants, their consent for participation, and data storage were key considerations. Ethics approval was granted on 24 July 2014 (Ethics Ref No: H0014101).

2.7. Chapter summary

This thesis adopts a qualitative research design to study the characteristics of the current Tasmanian coastal governance regime and the features of a resilience-based arrangement. Although constructivism was identified as a potentially suitable theory to consider the key notions, the research was undertaken using an adaptive research approach. An inductive approach was used to propose the features of a desirable coastal governance arrangement (such as identifying required attributes). However, the abductive reasoning was adopted to explain features and functions of these arrangements and the power and utility of resilience thinking in coastal governance beyond the case study area.

Methods to achieve the research objectives included literature review, case study, online survey, and semi-structured interviews. Triangulation and a mixed method approach were deployed to collect a variety of qualitative and quantitative data from various sources, thereby increasing the reliability and richness of the data. Mixed methods included a quantitative survey as well as qualitative interviews. The next chapter will present the overall literature review for the research project.

Chapter 3. **Literature review**

This chapter aims to deliver a literature review of the key concepts and ideas relevant to the research. Conventional approaches in dealing with environmental and natural resource problems are first discussed. A review of the concepts of environmental governance is provided along with divergences and convergences within environmental management literature. This review is followed by a description of the concepts of resilience and SESs. A resilience thinking framework is then conceptualised and the key features introduced. Finally, the idea of resilience-based coastal governance is examined and its attributes identified.

3.1. Conventional approaches to environmental management

For decades, a range of management approaches has dealt with environmental and natural resource problems. Management is typically described as "the capacity to control, handle or direct" (Mitchell 2013, p. 6) a system toward its pre-planned desirable condition. The main focus of the management approaches has been on evaluation, monitoring, measurement, adaptability and maintaining system states (Pahl-Wostl 2009).

This section will analyse conventional environmental and natural resource management approaches: sustainability, risk assessment and management, the precautionary principle, vulnerability assessment, ecosystem-based management and adaptive management. The purpose of the analysis is to provide a general understanding of the limitations of these approaches in dealing with social and ecological complexity and uncertainty in coastal areas.

3.1.1. **Sustainability approach**

The conceptualisation and application of sustainability approach in environmental studies have been developing and evolving since emerging in 1972. The sustainability approach emphasises on ongoing protection and maintenance to achieve long-term utilisation and conservation of natural values and social welfare (Bell & Morse 2008; Clayton & Radcliffe 1996). The central assumptions in sustainability approach include: ecosystems linearity, performance optimisation to achieve Maximum Sustainable Yield (MSY), the existence of an equilibrium state and the ability to return to the near-equilibrium stability (Gunderson & Holling 2001; Holling et al. 2002). Also, sustainability focuses on simplifying the complexity

of social-ecological systems, the predictability of environmental changes and safeguarding natural and human systems (Ahern 2011).

Over time, the concept of "sustainable development" has emerged to incorporate the notion of growth and progress into sustainability discourse. Sustainable development is defined as "a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs" (Brundtland et al. 1987, p. 17). Since then, sustainability and sustainable development approaches have been applied in environmental research areas such as coastal management (Craig & Ruhl 2010) and climate change adaptation (Smit & Pilifosova 2003).

Although sustainability and sustainable development have been used interchangeably, some scholars argue there are key differences in their definitions. Sustainability is a general idea that addresses the procedure of setting long-term goals to maintain or enhance the condition of natural and social capital. On the other hand, sustainable development, especially under the dominant neoliberal paradigms, is more concerned about human development and economic progress rather than natural and social values (Benson & Craig 2014; Redclift 2005).

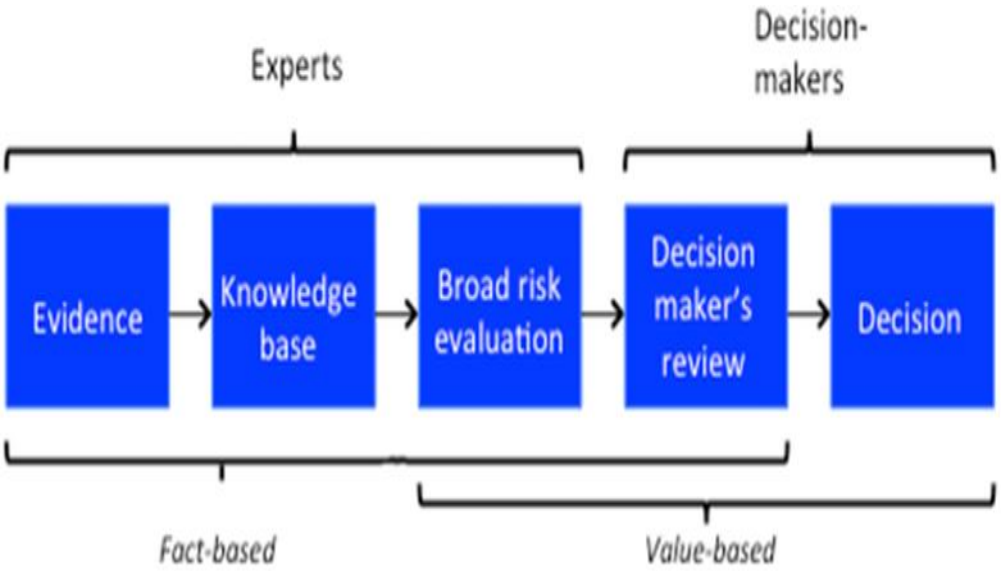
Scholars indicate the limitations and drawbacks of sustainability approach in both environmental and social research. For example, Benson & Craig (2014) claim that sustainability approach is based on an idealistic assumption of the existence of an optimum condition for social and ecological systems, which has resulted in setting unrealistic sustainability objectives and measures. The influence of neoliberal policy on sustainability approaches has led to insufficient attention to social concerns such as equity and fairness (Benson & Craig 2014; Lele 1991). Researchers argue that due to increasing environmental and social change sustainability approach could not address "what actually is needed to be sustained and how?"; therefore, identifying clear sustainability objectives and appropriate pathways to achieve them remains controversial (Benson & Craig 2014; Lele 1991). In addition, researchers indicate the limitations of sustainability approach to address the dynamics of complex adaptive systems and associated cross-scales interactions (Walker et al. 2004). In this respect, scholars identify a requirement to go beyond the existing

"traditional sustainability" discourse and develop more responsive foundations for sustainability approach (Walker et al. 2004; Walker & Salt 2006).

3.1.2. **Risk management**

Jones (2001, p. 197) argues that environmental risk-based approaches (including risk assessment and management) are "the processes of identifying, evaluating, selecting, and implementing actions to reduce risk to human health and to ecosystems". While risk assessment refers to the factual-based processes of identifying risks and hazards, risk management is about the value-based decision-making procedure and developing responsive strategies (Aven 2016; Beer & Ziolkowski 1995; Hansson & Aven 2014; Jones 2001). In this respect, while risk assessment is mostly based on factual data and scientific principles, risk management is influenced by social and political drivers (Aven 2016; Felter et al. 2009; Hansson & Aven 2014) (Figure 3.1).

Figure 3.1. Stages of risk assessment and management



Source: Hansson and Aven (2014, p. 1177)

Applications of risk-based approaches encompass a broad range of social and environmental studies including water and land pollution control (Li et al. 2014), ecological studies (Suter II 2016), climate change adaptation (Jones 2001), disaster management (Smith 2013), and marine and coastal management (Gornitz et al. 1994). Despite the popularity of risk-based approaches, the benefit of applying this approach in environmental planning and management is widely disputed. The major arguments against risk management relate to:

misunderstandings and misperceptions of the underpinnings; scale mismatches in the administering risk across different scales; high concentration on threats, hazards and the levels of risk-aversion in associated attitudes to management; and domination of neoliberal paradigms and economic drivers in the conventional risk management processes (Eburn & Dovers 2013; Hubbard 2009).

For example, scholars argue that domination of neoliberal mindset is encouraging an unnecessarily risk-averse attitude in the implementation of risk-based approaches (Bardsley & Pech 2012; Eburn & Dovers 2013). This attitude is shifting governments' roles to prevent "social bads" instead of creating "social goods" (Eburn & Dovers 2013; Mythen 2004). Under a risk-averse mindset, governments are more concerned with defending themselves from potential consequences of threats rather than protecting communities' values and interests (Eburn & Dovers 2013). As a result, governments focus on privatising risks and shifting their risk liabilities to non-governmental institutions and communities (Hood 2002; Quiggin 2007).

Another criticism concerns the overreliance of risk-based approaches on the predictability of the environment and the ability to anticipate environmental changes and associated risks (Sunstein 2005). Ahern (2011) argues that the main aim of risk-based approaches is to create a "fail-safe" system. The domination of "risk-free" mindset could potentially interrupt system development, undermine the capacity of leadership for change, and weaken novelty, innovation and the ability to identify new opportunities (Sunstein 2005).

3.1.3. **The precautionary principle**

The precautionary principle is an approach to address uncertainty and control the associated risks (van Asselt & Vos 2006). This approach emphasises undertaking strategies for risk prediction and developing measurements to prevent and control associated hazards (Ahteensuu & Sandin 2012; Aven 2016). In other words, the precautionary principle aims to predict and control risk to protect people and the environment against likely harmful consequences (Harremoës et al. 2013; Sunstein 2005).

The precautionary principle has been broadly accepted and applied in environmental decision-making and policy development (Harremoës et al. 2013; van Asselt & Vos 2006).

The approach rapidly attracted political attention and has been widely adopted in international and national legislation, protocols, treaties, and public policy domains (Sunstein 2005). For example, principle 15 of the Rio Declaration of the United Nations Conference on Environment and Development (UNCED) states “in order to protect the environment, the precautionary approach shall be widely applied by states according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (UNCED 1992).

In Australia, like many other countries, the precautionary principle is a key element in environmental governance and associated legislation, policy and planning frameworks (Gullett 2000; Kriwoken et al. 2006). There are direct references to the application of the precautionary principle in national level marine and coastal legislation (Kriwoken et al. 2006). However, Kriwoken et al. (2006) argue that this application is not adequate or well established and requires additional support by state-level legislative frameworks.

Despite the popularity of the precautionary principle, its application in environmental governance and management has been questioned. Due to the domination of risk-based concepts in the precautionary principle (such as threats, risks and hazards), Sunstein (2005) termed it as “laws of fear”. In this respect Sunstein (2005) claims that although applying the precautionary principle could minimise harms in the short term, it may increase the likelihood of severe adversities in the long run.

van Asselt and Vos (2006) address the “uncertainty paradox” of the precautionary principle that affects the validity of “risk regulation” outcomes. Risk and uncertainty are two inter-related elements in the precautionary principle that influence each other (van Asselt & Vos 2006). Increasing uncertainty is a risk, and risk identification is an uncertain process. Under this paradoxical situation, developing appropriate processes for risk identification and regulation is unclear and cumbersome (van Asselt & Vos 2006). Further drawbacks of the precautionary principle include being unclear about risks identification and the degree of required precaution, being “absolutist” and inflexible, and being unnecessarily risk-averse (Gullett 2000; Kriebel et al. 2001; Sandin 1999).

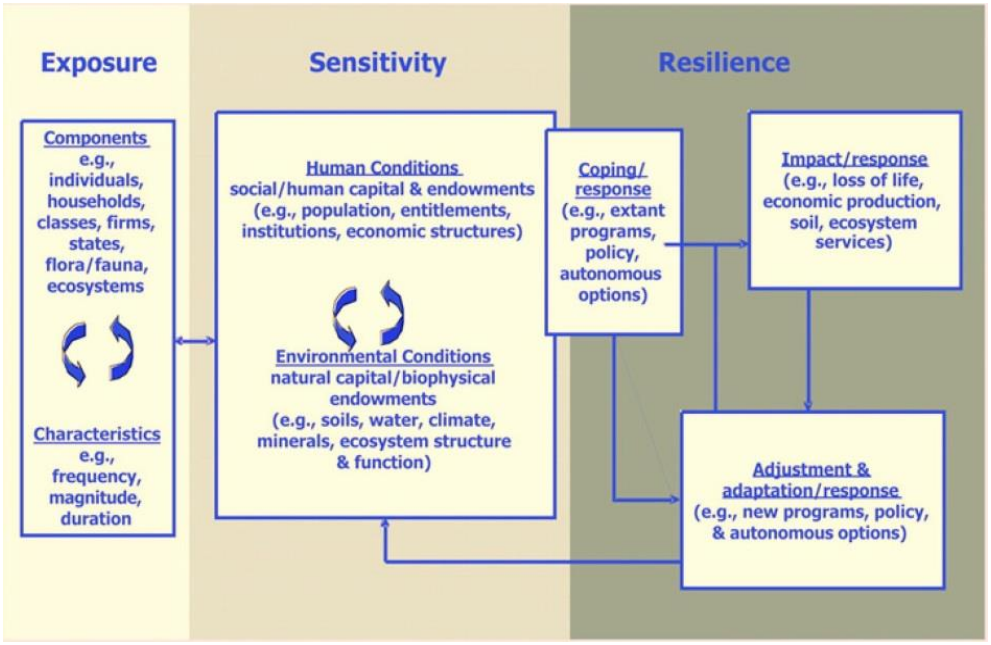
3.1.4. **Vulnerability approach**

In the last few decades, the vulnerability approach has been developed as a key method in environmental research and management (Adger 2006; Gallopín 2006; IPCC 2014). This approach has increasingly become a favoured means to study climate change impacts on the Earth systems, including coastal systems (Adger et al. 2005; Harvey & Woodroffe 2008; Moser et al. 2012). The vulnerability approach has been variously defined and applied in different contexts (Hufschmidt 2011). Nevertheless, it is generally accepted that vulnerability indicates the degree of susceptibility of a system to potential hazards and risks (Adger 2006; Brooks 2003; Hufschmidt 2011).

Assessing and measuring the vulnerability of a system is a complex matter. The degree of vulnerability depends on the features of any focal system as well as the characteristics of any particular risk (Gallopín 2006; Luers 2005). Gallopín (2006) maintains that while a system could be vulnerable to a particular risk, it might be resilient to others. Adger (2006, p. 268) argues that "[the] concept of vulnerability has been a powerful analytical tool for describing the states of susceptibility to harm, powerlessness, and marginality of both physical and social systems, and for guiding normative analysis of actions to enhance well-being through reduction of risk".

Concepts such as risk, hazard, sensitivity, adaptation, adaptive capacity and resilience have been identified as central notions in a vulnerability approach (Brooks 2003; Gallopín 2006; Hufschmidt 2011). Measuring system's vulnerability is a compromise between these elements and the degree of exposure to risks (Gallopín 2006; Luers 2005). Examining the relations between vulnerability and resilience (Figure 3.2) has been the subject of much research (Berkes 2007; Gallopín 2006; Klein et al. 1998). Resilience is conceptualised by Berkes (2007) and Hufschmidt (2011) as a measurable feature of a system that shows the degree of vulnerability. This definition provides an interpretation of resilience that is opposite to vulnerability (Gallopín 2006; Smit & Wandel 2006)

Figure 3.2. Schematic view of the elements of vulnerability



Source: Jordão and Moretto (2015, p. 77); Turner et al. (2003)

Despite the broad application of the vulnerability, inconsistencies in understandings of the concept, difficulties in measuring system vulnerability, and complications in its incorporation into environmental planning and management practice were identified as the main drawbacks of the approach (Cardona 2004; Gallopín 2006; Hinkel 2011; Hufschmidt 2011; Schroeder & Gefenas 2009). For example, a major criticism has been raised about the lack of conceptual clarity about the precautionary principle in each area of application (Brooks 2003; Gallopín 2006; Hufschmidt 2011).

For example, identification of vulnerability indicators is a major issue. Hinkel (2011) argues that quantitative measurement of system vulnerability could be deceptive, and the outcomes could potentially generate inaccurate results. In addition, Cardona (2004) notes that while a vulnerability approach aims to control and reduce uncertainty and risk, the growing trend of environmental and social degradation reveals an increase in the vulnerability of the Earth's systems (Cardona 2004). Instead of quantitative approaches, Cardona (2004) argues a necessity to undertake more qualitative approach to analysing risks and hazards.

3.1.5. **Ecosystem-based management**

In the 1980s, ecosystem-based management (EBM) was introduced into the field of environmental research, natural resource management and climate change adaptation (McKinnon & Hickey 2009), fisheries research (Berkes 2012), and coastal and marine management (Arkema et al. 2006; Barbier et al. 2008). Slocombe (1993) indicates that traditional ecosystem management approaches revealed difficulties in adopting regional and landscape scale views to identify the features of ecosystems. To respond to this shortcoming, EBM seeks to integrate human development and ecological processes, consider associated interconnections, and attempts to place the humans "back into the ecosystem" (Berkes 2012; Tallis et al. 2010).

EBM enhances the capacity of the ecosystem management to deal with social and ecological complexity and dynamic (Berkes 2012; Levin et al. 2009). The approach can deliver mechanisms for responsive and effective implementation of ecosystem management (Layzer 2008). EMB emphasises the necessity of a collaborative, integrated, flexible and adaptive approach to deal with the complexity and dynamic of environmental problems (Berkes 2012; Layzer 2008; Leslie & McLeod 2007; Slocombe 1993).

Several models, features and criteria have been proposed to develop and implement an effective EBM (Berkes 2012; Layzer 2008). For example, "ecosystem stewardship" was identified as a "strategy" to assist the implementation of EBM in the real world (Berkes 2012). An effective ecosystem stewardship should account for change and uncertainty (Berkes 2012; Berkes & Jolly 2002). In addition, Curtin and Prellezo (2010) argue that from an EBM point of view, ecosystems are complex adaptive systems linked across scales, therefore, decisions at one level can influence other levels. In this respect, partnerships and collaboration are required for an effective application of EBM.

Despite broad appeal of EBM, scholars have identified drawbacks and barriers to effective implementation and evaluation. The key issues include complicated and costly implementation, extensive data requirements, lack of evidence to support its utility, and difficulties of evaluation and monitoring the outcomes (Katsanevakis et al. 2011; Leslie & McLeod 2007; Tallis et al. 2010). For example, due to complications of implementing EBM in large-scale projects, some researchers dispute the availability of adequate and reliable data

to validate theoretical basis of the EBM and evaluate its utility (Berkes 2012; Katsanevakis et al. 2011; Tallis et al. 2010). In this respect, Tallis et al. (2010) argued that an EBM approach is primarily based on theoretical assumptions rather than experimental evidence.

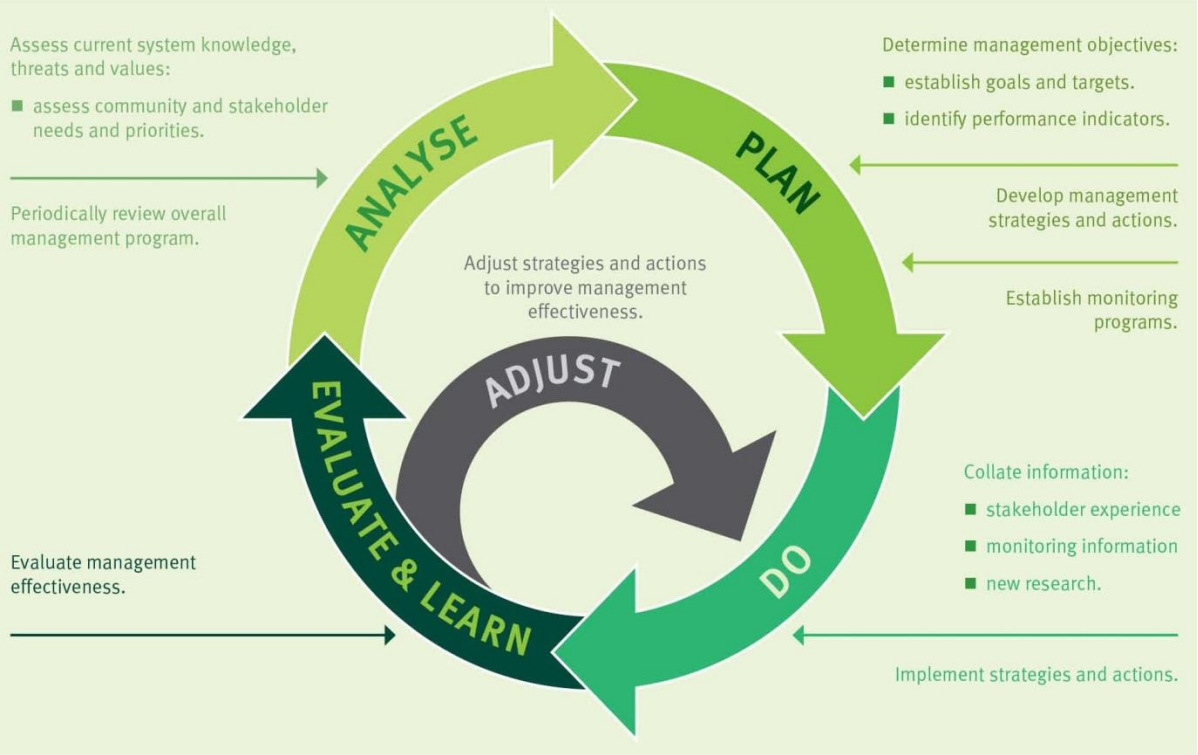
3.1.6. **Adaptive management**

Seeking an adaptive approach has been a major concern in environmental and natural resource management. An adaptive approach should account for flexibility, integrity, dynamic and complexity of social-ecological systems (Gunderson 1999; Holling 2001). To respond to this need, an "adaptive management" approach was introduced to the scholarship (Argent 2009; Schreiber et al. 2004). Adaptive management approach aims to respond to the problem of science-policy interface and facilitate the application of scientific experimentation (Rist et al. 2013).

Adaptive management encompasses many aspects of management issues, from large-scale theoretical concerns to small-scale actions (Argent 2009). Generally, the approach refers to the process of "learning while doing" (Armitage et al. 2009; Schreiber et al. 2004). Adaptive management enables ecosystem managers to be forward-looking while they consider the past experiences (Allan & Curtis 2005). So, adaptive management is a cyclic procedure of planning future actions based on previous experiences.

The main stages of an adaptive management cycle are: designing and planning, operating and implementing, monitoring and evaluation, and analysis and learning (Argent 2009; Schreiber et al. 2004) (Figure 3.3). Scholars argue that the first stage (designing and planning) is an important phase that could influence the entire process of adaptive management (Schreiber et al. 2004). This stage is followed by an operational phase that generates first-hand knowledge and information (Argent 2009). The new knowledge could be utilised to enhance management capacity to deal with plausible uncertainties and inform the subsequent evaluations and learning phase.

Figure 3.3. Adaptive management cycle



Source: CSIRO (2009)

Despite the popularity of adaptive management, scholars identify the barriers and limitations of the application of the approach in environmental research and implementation. For example, Schreiber et al. (2004) indicate that due to the broadness and complexity, adaptive management has been widely misinterpreted and misunderstood. Allen and Gunderson (2011) identify the limited capacity of adaptive management approach to deal with shocks and surprises. Other limitations of the approach include inadequate mechanisms for stakeholder engagement and difficulties in implementing processes in accordance with the adaptive management cycle (Allen & Gunderson 2011).

Lack of implementation programs that acquire valid data is another barrier to the effective application of adaptive management (Allen & Gunderson 2011). Some scholars argue the unsuitability of implementation of the approach on larger scales (Rist et al. 2013). Due to extensive economic and political costs associated with implementing adaptive management to large-scale projects, and the predominant economically focussed attitudes and risk-averse political mindsets, adaptive management has primarily been applied in small-scale

case studies (Allen & Gunderson 2011; Rist et al. 2013). Therefore, the suitability of the application at a broader scale context has not been adequately examined (Rist et al. 2013).

Another problem of implementing an adaptive management framework refers to the limitations of management structures. Because management activities normally take place in a broader governance context, a management system is restricted by the attributes that are beyond its control (Rist et al. 2013). In this regards, Walker et al. (2004) refer to the failures of adaptive management practices due to the malfunction of broader governance arrangements.

Criticisms about responsiveness and effectiveness of adaptive environmental management highlight the problem that top-down and "command and control" governance does do not allow adaptive management systems to perform effectively (Janssen & Ostrom 2006; Walker et al. 2004). Management-based systems are argued to be simplistic and hierarchical and have a limited technically-framed outcome orientation (Armitage et al. 2012; Pahl-Wostl 2009). Adaptive management procedures mainly rely on scientific and technical aspects without adequately accounting for social parameters (Ludwig 2001; Walker & Salt 2006). Consequently, they have limited capacity to respond to the emergent complexity and uncertainty of environmental and social problems in the coastal areas (Ludwig 2001; Walker & Salt 2006).

To respond to these problems, scholars indicate the necessity of alternative approaches (or frameworks), which are responsive to social-ecological complexity while facilitating collaboration and communication across temporal and spatial dimensions (Duxbury & Dickinson 2007; Hopkins et al. 2011; Nobre 2011). The following sections examine the ideas of governance and resilience thinking as potential responses to deal with the complexity of coastal decision-making, policy development and planning under social and environmental change and uncertainty.

3.2. Environmental governance: features and requirements

Governance is a broad and complex concept (Pahl-Wostl 2009). In general, governance is defined as "the exercise of political, economic and administrative authority in the management of a country's affairs at all levels. Governance comprises the complex mechanisms, processes, and institutions through which citizens and groups articulate their

interests, mediate their differences, and exercise their legal rights and obligations" (UNDP 1997). In a political science context, Fukuyama (2013, p. 350) argues that "governance is about the performance of agents in carrying out the wishes of principals, and not about the goals that principals set [...] governance is thus about execution, or what has traditionally fallen into the domain of public administration, as opposed to politics or public policy". Usefully, Graham et al. (2003, p. 1) define governance as "a process whereby societies or organizations make their important decisions, determine whom they involve in the process and how they render account". The underpinnings of governance idea typically concern strategic issues such as arrangements, procedures, conventions and policies that identify how the decisions are made, who is responsible for that and to what degree (Graham et al. 2003). Kettl (2015) argues that governance is about "crossing the boundaries" between international arrangements, public sectors, private institutions, NGOs and individuals and sharing accountabilities and responsibilities among them.

Governance is different from the government; it is about how governments share power and accountability with other social groups (Graham et al. 2003; Holley et al. 2011). Governance arrangements can ensure that different groups in a society have a voice, power, authority and responsibility (Holley et al. 2011; Newig & Fritsch 2009; Plummer et al. 2013). Kettl (2015) addresses the participatory and collaborative aspects of the idea of governance and argues that robust participation processes can be established by weakening the conventional top-down approaches and strengthening more bottom-up procedures.

With the recognition for the need for more collaborative and democratic frameworks in environmental decision-making, and the drawbacks of environmental management approaches, scholars have identified requirements for incorporation of the concept of governance into environmental research and practice (Armitage et al. 2012; Ludwig 2001; Pelling 2010). In this respect, the concept of environmental governance has emerged as a response to political, economic, social and ethical considerations in environmental decision-making and policy development (Adger et al. 2003). Over the last few decades, the concept of governance has been widely applied in environmental and natural resource studies including biodiversity conservation (Lockwood et al. 2014; Mitchell et al. 2015), terrestrial and marine protected areas (Lockwood 2010), natural resource management (Clement

2010), fisheries management (Allison et al. 2012; Jentoft 2007), and coastal decision-making (Milligan & O'riordan 2007).

Environmental governance is defined as a "set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes" (Lemos & Agrawal 2006, p. 298). As Chaffin et al. (2014, p. 1) argue, "environmental governance is the system of institutions, including rules, laws, regulations, policies, and social norms, and organizations involved in governing environmental resource use and/or protection, and there are a variety of different approaches". Biermann et al. (2009, p. 3) define environmental governance aims to "steer societies toward preventing, mitigating, and adapting to global and local environmental change and, in particular, earth system transformation, within the normative context of sustainable development".

The purpose of environmental governance is not limited to improving efficiency and productivity (Adger et al. 2003; Armitage et al. 2012; Chaffin et al. 2014). On the contrary, it aims to improve effectiveness, adaptability, transformability through flexibility, diversity, polycentrism and embedded consideration of social and ethical concerns (Adger et al. 2003; Garmestani & Benson 2013; Lockwood et al. 2012).

Graham et al. (2003) argue that identifying "good governance" principles is challenging. However, it is essential to provide an appropriate description of good governance and identify the related criteria for evaluating governance performance and developing improvement strategies (Lockwood 2010). According to Lockwood (2010), a good environmental governance system is the matter of "appropriateness", "quality" and "effectiveness". A good governance regime should also respond to social-ecological complexity, uncertainty, and dynamics (Armitage et al. 2012; Underdal 2010). Underdal (2010) indicates that the "time-lag" between the cause (drivers of change such as climate change) and the effect (environmental consequences) should be taken into consideration in developing a good governance system.

Good environmental governance refers to collaborative, participatory, multi-scalar, multi-actor and trans-disciplinary processes of environmental decision-making and policy development (Mattor et al. 2014; Newell et al. 2012; Newig & Fritsch 2009). Environmental governance concerns regulatory frameworks, problem-solving mechanisms, institutional

adaptability, social learning, political leadership and democratic decision-making (Clement et al. 2016; Holley et al. 2011; Lemos & Agrawal 2006; Paavola 2007). Holley et al. (2011) address the idea of 'new environmental governance' and indicate that such a structure is innovative, flexible, open-ended, collaborative, adaptive, less hierarchical and less prescriptive.

Graham et al. (2003) identify five principles of good governance: legitimacy, direction, performance, accountability and fairness. Lockwood et al. (2010) argue legitimacy, transparency, accountability, inclusiveness, fairness, integration, capability and adaptability as eight pillars of natural resource governance in Australia. Duxbury and Dickinson (2007) suggest sustainability, adaptive management, participation and integration as the foundations of sustainable governance of coastal areas. An overview of the characteristics of good environmental governance is given in Table 3.1.

Despite similarities between governance and management, there are essential differences between the two concepts. Armitage et al. (2012) argue that management systems are more concerned about technical issues and finer scale implementations to achieve a particular outcome. Conversely, governance relates to a higher level decision-making and policy development and has broader application in a social domain (Armitage et al. 2012). In comparison with management, the concept of governance considers participatory, multi-scalar and intersectional arrangements to address social-ecological systems (Mattor et al. 2014). Pahl-Wostl (2009) indicates that the main approaches in resource management artificially simplify system complexity, whereas governance-based approaches attempt to holistically embrace the complexity, connectedness and transformational possibilities in the processes decision-making and policy development.

Table 3.1. Characteristics of a good environmental governance

Characteristic	Focus	Supporting sources
Innovative, flexible, open-ended, collaborative, participatory, flexible, integrative, multi-level, adaptive, less hierarchical and less prescriptive	General environmental governance	(Holley et al. 2011)
Legitimacy, direction, performance, accountability and fairness	General governance	(Graham et al. 2003)
Legitimacy, transparency, accountability, inclusiveness, fairness, integration, capability and adaptability	Terrestrial protected areas	(Lockwood et al. 2010)
Consider sustainability, adaptive management, participation and integration	Coastal sustainability	(Duxbury & Dickinson 2007)
Legitimacy, transparency, accountability, inclusiveness, fairness, connectivity and resilience	Natural resource management	(Lockwood 2010)
Diversity of information, considering actors' value, social capital, acknowledging change, adaptability, adaptability	Marine conservation	(Lockwood et al. 2012)
Institutional fit and scale; adaptiveness, flexibility and learning; the coproduction of knowledge from diverse sources; the emergence of new actors and their roles in governance; and changing expectations about accountability and legitimacy	Conservation management	(Armitage et al. 2012)
Scientific knowledge	Coastal governance	(McFadden 2007)
Authority, leadership, visioning, institutional capacity, human resource development, empowerment, financial management, planning capacity, conflict resolution, monitoring and evaluation capacity, implementation capacity, public participation	Coastal governance	(Ehler 2003)
Exclusion of unauthorised users; regulation of authorised resource uses and distribution of their benefits; provisioning and the recovery of its costs; monitoring; enforcement; conflict resolution; collective choice	Environmental governance	(Paavola 2007)
Institutions-formal and informal; role of actor groups, state, non-state actors; multi-level interactions; governance modes-bureaucratic hierarchies, markets, networks	Water resource governance	(Pahl-Wostl 2009)

3.3. Resilience, resilience thinking and Social-Ecological Systems

Since Holling (1973a) introduced the idea of resilience to the field of ecology, the idea has become a favoured approach to addressing multi-disciplinary contexts and problems (Xu & Marinova 2013). Resilience has evolved from a concept indicating a property of an ecological system (Holling 1973a) to an approach within the sustainability paradigm (Walker & Salt 2006), and finally to an overarching framework that could potentially substitute a sustainability approach (Benson & Craig 2014).

Definitions and interpretations of resilience are diverse and contested (Walker & Salt 2012). Different areas of research have diverse explanations and understandings of resilience. The concept of resilience from ecological literature concerns the quality of responses that a complex adaptive system (with self-organising capacity) develops to deal with drivers of change, uncertainties and system dynamics (Argent 2009; Folke et al. 2010; Holling 2001; Walker & Salt 2012; Walker & Salt 2006). Rather than resilience as a quantifiable "property of a system", other conceptualisations focus on "resilience thinking" as an overarching "frame of mind" (Walker & Salt 2012). In this section, the concept of resilience, and various associated definitions and characterisations, will be scrutinized, and a resilience thinking framework developed for deployment throughout the rest of this thesis.

3.3.1. Ecological resilience: an overview and main definitions

The foundations of ecological resilience were established in the 1960s in the context of attempts to conceptualise ecological dynamics and challenge notions of ecological stability and equilibrium states (Gunderson, Holling and Allen 2012)a; (Gunderson, Holling and Allen 2012; Lewontin 1969). Holling (1973a) introduced the concept of "ecological resilience" that has subsequently been various and widely adopted, reviewed and applied (Folke et al. 1998; Gunderson, Holling and Allen 2012; Hodgson et al. 2015; Walker et al. 2002).

Holling (1973a) discusses a significant distinction between a system's "resilience" and "stability". He argues that stability is a system's capacity to recover and return to its near equilibrium state after a disturbance, but resilience illustrates a system's "persistence" to maintain its identity and functionality. In this regard, an unstable system could be highly resilient and vice versa. Two different types of resilience have been addressed in the

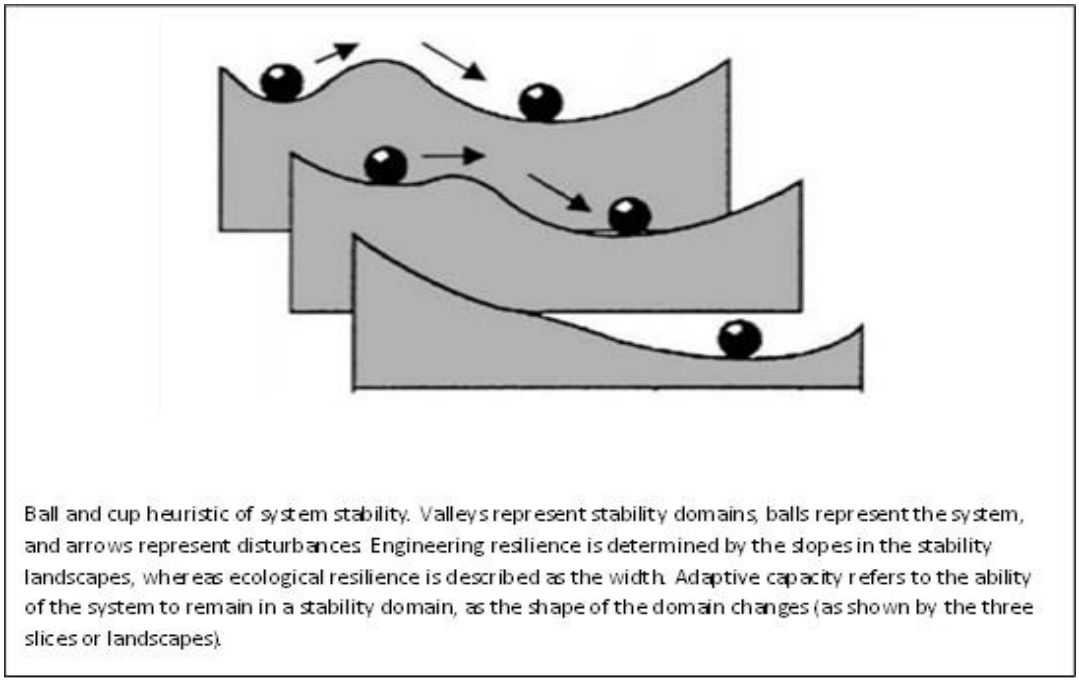
literature including “engineering” and “ecological” resilience, which originated from stability theory and resilience framework respectively (Gunderson 2000; Holling 1996a).

Engineering resilience arose from the deductive tradition of science and mainly focused on human-designed structures that have the low self-organising capability (Gunderson & Pritchard Jr 2003). Engineering resilience is driven by an efficiency-based mindset and aims to optimise productivity and MSY (Holling 1996a). Also, this form of resilience is a measurable property of systems that could be indicated by how fast or slow a disrupted system returns to its stability state (Brand 2009; Gunderson 2000). Engineering resilience mainly refers to system’s elasticity and predictability of the environment (Gunderson & Pritchard Jr 2003).

On the other hand, ecological resilience, with its roots in applied mathematics and ecology, indicates a property of a system that facilitates “transition” between multiple stability states. In contrast to engineering resilience, ecological resilience deals with complex adaptive systems and self-organising capacity (Gunderson 2000; Gunderson & Pritchard Jr 2003). Ecological resilience is defined as the capacity of an ecological system to tolerate disruption without changing its current structure and functions (Holling 1973a; Walker et al. 2004).

Similar to engineering resilience, ecological resilience is a measurable concept (Brand 2009; Gunderson & Pritchard Jr 2003). Definitions of ecological resilience incorporate the following ideas: a paradigm shift from understanding ecosystems as linear to non-linear structures; the existence of multiple stability domains instead of an optimum stable state; flexibility of ecological systems rather than elasticity and “timely recovery”; and self-organisation, adaptability and the capacity to persist in the face of change (Carpenter et al. 2001; Gunderson, Holling and Allen 2012; Holling 1996a). Figure 3.4 illustrates the differences between ecological and engineering resilience.

Figure 3.4. Schematic view of system stability and resilience



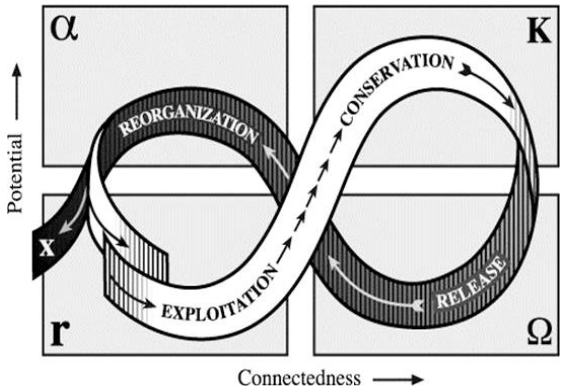
Ball and cup heuristic of system stability. Valleys represent stability domains, balls represent the system, and arrows represent disturbances. Engineering resilience is determined by the slopes in the stability landscapes, whereas ecological resilience is described as the width. Adaptive capacity refers to the ability of the system to remain in a stability domain, as the shape of the domain changes (as shown by the three slices or landscapes).

Source: Gunderson, Holling, Pritchard, et al. (2012)

Scholars address two central notions of ecological resilience: the adaptive cycle and panarchy. The adaptive cycle represents the dynamics of ecological systems and underlines multiple domains of attractions or stability states (Holling 1996a; Walker et al. 2004). The adaptive cycle encompasses four stages: growth and exploitation (r), conservation and maintenance (k), chaos and release (Ω), and reorganisation (α). In the first two phases, an ecological system is less flexible and more predictable whereas in the last two phases changes are rapid and unpredictable (Gunderson & Holling 2001; Holling 2001) (Figure 3.5).

Panarchy concerns hierarchical and cross-scale relations between multiple adaptive cycles at different scales (Holling 1996a; Holling et al. 2002). Panarchy is described as "how a healthy system can invent and experiment, benefiting from inventions that create opportunity while being kept safe from those that destabilise because of their nature or excessive exuberance" (Holling 2001, p. 390). As Gotts (2007) explains, panarchy is a two-way relationship between large-scale slower systems and associated smaller-scale faster systems.

Figure 3.5. Adaptive cycle



A stylized representation of the four ecosystem functions (r, K, Ω, α) and the flow of events among them. The arrows show the speed of the flow in the cycle. Short, closely spaced arrows indicate a slowly changing situation; long arrows indicate a rapidly changing situation. The cycle reflects changes in two properties: the y axis (the potential that is inherent in the accumulated resources of biomass and nutrients) and the x axis (the degree of connectedness among controlling variable). The exit from the cycle indicated at the left of the figure suggests, in a stylized way, the stage where the potential can leak away and where a flip into a less productive and less organized system is most likely.

Source: Gunderson and Holling (2001, p. 34)

A resilience-based approach to environmental governance and management challenges conventional hierarchical and command and control approaches (Holling 1973a). Rather than maintaining the ecosystem stability in the near-equilibrium state, a resilience-based approach aims to deliver a holistic and broader approach to decision-making, policy development and planning (Holling 1973a, 1996a). Also, a resilience-based approach does not require detailed information on numerous variables, but focusses on a strategic understanding of a limited number of critical drivers, processes and responses (Walker et al. 2006). In this respect, a resilience-based approach recognises uncertainty and acknowledges limitations of information availability and processing capacity (Walker & Salt 2012; Walker & Salt 2006).

3.3.2. **Social-ecological systems**

In last few decades, many attempts were made to integrate “social” and “ecological” systems (Adger 2000; Berkes & Folke 2000). Scholars argue that conventional integration methods are simplistic and due to fragmented views and partial integration methodologies some synergetic aspects between the social and ecological systems are missed or ignored (Berkes & Folke 2000; Westley et al. 2002). A number of terms have emerged to address the

outcome of the integration process including “socio-ecological systems” (Azar et al. 1996; Gallopin 1991); “natural and socioeconomic systems” (Levin et al. 1998; Turner 2000), “ecological-socioeconomic systems” (Carpenter et al. 2002), and “human-environment systems” (Turner et al. 2003). The concept of coupled “social-ecological systems” (SESs) has emerged and gained prominence (Berkes & Folke 2000; Carpenter et al. 2001; Holling 2001). The concept of an SES aims to blend social and ecological structures and address the idea of “humans-in-nature” (Berkes & Folke 2000). SESs have been widely adopted as a concept in environmental governance and natural resource management (Binder et al. 2013; Ostrom 2007).

An SES is a coupled human-nature system that encompasses natural parameters, human interventions and synergetic feedbacks between them (Anderies et al. 2006; Hinkel et al. 2015; McGinnis & Ostrom 2014; Walker et al. 2004). Although human and natural sub-systems could be individually identified in an SES, they are strongly interdependent for analytical and implementation purposes (Walker et al. 2006). Due to their complexity, dynamic and self-organising capacity, SESs reflect the characteristics of complex adaptive systems (Levin et al. 2013; McGinnis & Ostrom 2014). The complexity and dynamics of SESs evolve and vary within multiple spatial and temporal dimensions (Binder et al. 2013; Folke & Gunderson 2006).

In the development of the theoretical foundations of SESs, several associated terms have been deployed, including “model”, “theory” and “framework” (Berkes 2007; Ostrom 2007). As McGinnis and Ostrom (2014) argue, an SES “framework” offers a broader opportunity to develop further theories or models within the framework. Therefore, an SES framework is not just a subject (or a unit) of examination. It encompasses a set of embedded concepts that enable a holistic analysis of human-nature interactions (Hinkel et al. 2015; McGinnis & Ostrom 2014; Ostrom 2007). An SES is influenced by its features including resilience, adaptability, transformability, learning, non-linearity, strategic interactions, multi-scalar arrangements, cross-scale interdependences and the ability to deal with risk and uncertainty (Folke et al. 2010; Levin et al. 2013; Ostrom 2007; Walker et al. 2004).

The theoretical basis and application of an SES framework at the operational level have been broadly discussed and reviewed (Adger 2000; Sakai & Umetsu 2014; Walker & Salt

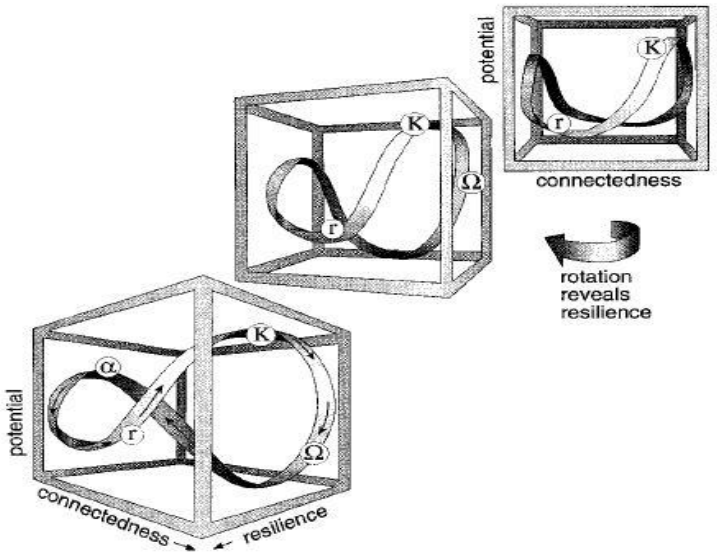
2006). While some researchers claim that an SES framework has no scientific foundation and operational applicability (Harrison 2003), others identify the advantages of the application of SES framework in social and environmental research (Adger et al. 2005; Leslie et al. 2015; Sakai & Umetsu 2014). Ostrom (2007) argues that in order to respond to the problems of any particular SES, its specific features should be individually considered and examined. Binder et al. (2013) examined applications of 10 different approaches to SES analysis and concluded that describing and analysing an SES depends on the particular characteristics of each focal system and analytical purpose. Although an SES framework provides a general account of human-environment relationships, in practice specific criteria which relate to the focus and priorities of each particular case study are needed (Binder et al. 2013).

Alessa et al. (2009) examined the applicability of an SES framework in analysing "messy SESs". A messy SES is a less organised system emerging from re-ordering the arrangements of a "neat SES" driven by factors such as technology (Alessa et al. 2009). A messy SES "encompass the totality of human settlements, including social organization and technologies that result in the movement of materials, energy, water, and people" (Alessa et al. 2009, p. 31). They conclude that an SES framework is an appropriate approach to analyse disorganised systems where predictability is low (Alessa et al. 2009).

3.3.3. **Social-ecological system resilience**

Early attempts to incorporate the concept of resilience in social-ecological analysis commenced in the early 2000s (Berkes & Folke 2000; Carpenter et al. 2001; Holling 2001). At that time, social-ecological resilience evolved from ecological resilience and was explained through heuristics such as the adaptive cycle and adaptive capacity (Berkes et al. 2003; Carpenter et al. 2001; Folke et al. 2002) (Figure 3.6). Since then, SES resilience has been variously interpreted and applied in multiple research domains.

Figure 3.6. Resilience in an adaptive cycle



Resilience is another dimension of the adaptive cycle. [This figure] shows how resilience expands and contracts throughout the cycle. Resilience shrinks as the cycle moves towards K, where the system becomes more brittle. It expands as the cycle shifts rapidly into a back loop to reorganize accumulated resources fora new initiation of the cycle.

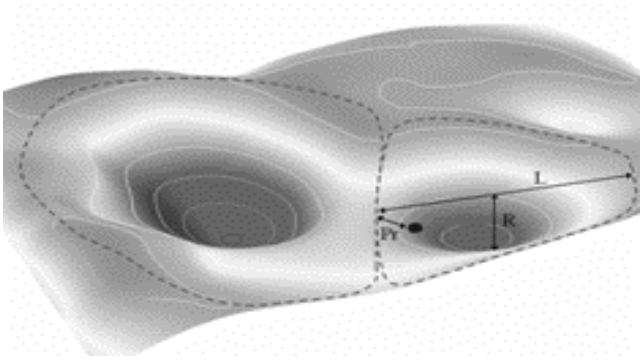
Source: Gunderson and Holling (2001, p. 41)

Carpenter et al. (2001, p. 756) point out that resilience has multiple definitions ranging from "a metaphor related to sustainability, as a property of dynamic models, and as a measurable quantity that can be assessed in field studies of SES." Walker et al. (2004) argue that to achieve a clearer understanding, SES resilience should be defined according to its constituting parameters (Walker et al. 2004). Most of the definitions of SES resilience refer to the capacity of a system to maintain the functionality and identity when the system is disrupted (Folke et al. 2010; Walker et al. 2004). For example, Walker et al. (2004, p. 1) define SES resilience as "the capacity of a [social-ecological] system to absorb disturbance and reorganize while undergoing a change so as to still retain essentially the same function, structure, identity, and feedbacks".

SES resilience aims to deliver a better understanding of system complexity and dynamics, reduce vulnerability, and enhance the adaptability of an SES (Berkes et al. 2003; Folke et al.

2002; Walker et al. 2004). SES resilience emphasises the idea of multiple basins of attractions and a "stability landscape" (Figure 3.7). According to Walker et al. (2004), a "state space" refers to variables that govern SES, a "basin of attraction" indicates preferred condition with particular state space, and "stability landscape" collectively describes a set of adjacent basins of attractions.

Figure 3.7. Representation of a stability landscape



Three-dimensional stability landscape with two basins of attraction showing, in one basin, the current position of the system and three aspects of resilience, L = latitude, R = resistance, Pr = precariousness.

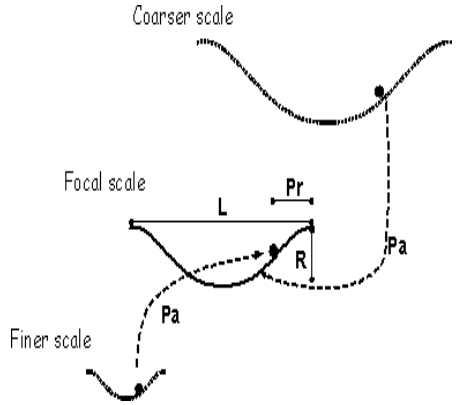
Source: Walker et al. (2004, p. 4)

Furthermore, Walker et al. (2004) introduce four interrelated attributes that affect SES resilience: latitude, resistance, precariousness and panarchy. Latitude is the width or extent of the basin of attraction, resistance concerns the shape of a basin of attraction and the extent to which a system can avoid change, and precariousness indicates the position of the system within the basin of attraction and its distance from edges or thresholds (Walker et al. 2004). Panarchy is another important feature of an SES which influences other three features (Walker et al. 2004). Panarchy identifies the interactions between a focal SES and other SESs at lower and higher scales (Walker et al. 2004) (Figure 3.8). Holling (2001, p. 398) states that panarchy shows "how a healthy social-ecological system can invent and experiment, benefiting from inventions that create opportunity while it is kept safe from those that destabilize the system due to their nature or excessive exuberance".

Unlike a hierarchy, which generally implies top-down relationships, panarchy is about the interactions and collaborations between scales in an adaptive cycle setting (Benson &

Garmestani 2011b). Panarchy plays an important role in responding the scale mismatch problems in environmental governance and can explain cross-scale dynamics of an SES and the resilience of the entire system (Garmestani et al. 2009). Gunderson and Holling (2001) argue that due to some additional features in social systems, such as “foresight, “communication” and “technology”, dealing with panarchy in the human components of SESs is more challenging than for the ecological components.

Figure 3.8. Panarchy in social-ecological systems



The fourth aspect of resilience in relation to a stability landscape—Panarchy (Pa); the influence of the states of the system (including where they are in their adaptive cycles) at scales above and below the focal scale, which affects the other three aspects (Fig. 1) by impacting the system directly (from the finer scale) or changing the stability landscape (from the coarser scale).

Source Walker et al. (2004, p. 5)

Janssen et al. (2007) maintain that the core notion of resilience thinking is to make SESs constantly reorganise around continual change. They argued that traditional adaptation capacity might enhance SES robustness to a particular pattern of risk, but the system could remain vulnerable to new forms of disruption. In this regard, Folke et al. (2010) address two different forms of resilience including “specific resilience” and “general resilience”. Specific resilience refers to certain issues that take place in particular parts of a system. Specific resilience answer the question of “resilience of what to what?” (Walker & Salt 2012). On the other hand, general resilience is concern about the entire system and associated complexity, dynamics and uncertainty (Folke et al. 2010).

3.3.4. **A resilience thinking framework**

As discussed earlier, scholars indicate a necessity for more holistic and adaptive approaches and frameworks to deal with dynamic nature of coupled SESs (Carpenter et al. 2005; Walker 2005). To respond to this requirement, and advance the concept of resilience by integrating it with an SES framework, Walker and Salt (2006) coined the term "resilience thinking". Since then, resilience thinking has been appreciated as a useful framework for environmental governance and management (Benson & Garmestani 2011a; Folke et al. 2010; Xu et al. 2015).

Janssen et al. (2007) eschew conventional interpretations of resilience that emphasise adaptation capacity. They argue that these interpretations make an SES resilient to particular forms of risk, but such systems may remain vulnerable to other types of threat and shocks. As a result, the concept of transformation was incorporated to define and formulate resilience of SES (Folke et al. 2010; Rockström et al. 2014; Walker & Salt 2012; Walker & Salt 2006). In this respect, transformability together with resilience and adaptability were identified as three key features of a resilience thinking framework (Folke et al. 2010; Walker & Salt 2012).

As Berkes (2007, p. 283) argued, resilience thinking is "forward-looking and helps to develop policy options for dealing with uncertainty and future change". This framework conceptualises SESs as able to "anticipate experiment, adapt and transform" (Rockström et al. 2014). Berkes (2007, p. 283) indicates that resilience thinking is about "creating opportunities for self-organization, including the strengthening of local institutions and building cross-scale linkages and problem-solving networks". Also, Lockwood and Harwood (2017) indicate the benefits of incorporating resilience thinking framework into Australian planning system.

Walker and Salt (2012) argue that application of resilience thinking should follow three stages: system identification, evaluating resilience, and resilience manipulation (management). Some scholar argues that practising resilience thinking is unappealing to ecological and social research (Olsson et al. 2015). Other researchers support the application of resilience thinking framework in environmental governance (Anderies et al. 2006; Benson & Craig 2014; Walker & Salt 2012). Potential benefits of applying resilience

thinking include: delivering a better explanation of the phenomena which is under examination; improving SES learning capacity; facilitating cross-scale and inter-sectional collaborations and communication; and enhancing the degree of diversity and complexity of a system (Benson & Craig 2014; Berkes 2007; Fazey 2010).

There are both divergences and convergences between resilience thinking and sustainability approaches. While some studies focus on the similarities between resilience thinking and sustainability, others highlight conflicting features of the two (Benson & Craig 2014; Folke et al. 2002; Walker & Salt 2006; Xu et al. 2015). In this respect, two distinct streams of thinking are evident. The first perspective proposes resilience thinking as a novel approach within the sustainability literature (Berkes 2007; Folke et al. 2002; Xu et al. 2015). The second suggests resilience thinking as a framework that can replace the sustainability discourse (Benson & Craig 2014; Davoudi et al. 2012). This debate has this opened up a new dialogue about sustainability (Xu et al. 2015). Resilience thinking has challenged core assumptions of the concept of sustainability such as MSY, near-equilibrium states and ecosystem linearity. Importantly, resilience thinking has introduced a new foundation to sustainability literature (Berkes 2007; Holling 1973a, 2001; Walker et al. 2004). For example, Holling (2001) addresses the concept of "sustainable development" and mentions that "development" is the capacity to generate "opportunity". He disputes that sustainability indicators could not properly address the notion of "development". To fill this gap, he argues incorporation of resilience, adaptive cycles, and panarchy into the sustainability discourse (Holling 2001).

In contrast, according to the second viewpoint, although sustainability approach could be adopted as an "overarching principle" to guide environmental governance processes, it fails to address essential features of SES in practice. Benson and Craig (2014, p. 779) claim that "by definition, sustainability assumes that there are desirable states of being for SESs that humans can maintain (within a certain range of variability) indefinitely". In addition, they argue that sustainability approach is not capable of accounting for regime shifts and system transformation (Benson & Craig 2014).

Overall, sustainability encourages risk-averse and conservative attitudes. Th sustainability approach is more concerned with what a system loses and aims to preserve the status quo (Benson & Craig 2014). On the other hand, a resilience thinking framework is more

concerned with enhancing flexibility, entrepreneurship, development, opportunities and achievements (Benson & Craig 2014; Berkes 2007; Holling 2001; Walker & Salt 2006). Table 3.2 shows the features of resilience thinking in relation to specific and general resilience.

Table 3.2. Key features of specific resilience, general resilience and resilience thinking

Specific resilience	General resilience	Resilience thinking
- Is the capacity to cope with specific type or pattern of risks. - Is a concept opposite to vulnerability. - Mainly is risk-averse and avoids risks. - It may make system resilient to a specific threat but make it vulnerable to others. - Mostly refers to timely recovery, reconstruction, rebound, renewal. - Relatively easy to measure.	- Is a property of a complex adaptive system. - Different interpretation in different areas - Is an approach which suits mid to low level policy application and management activities. - Difficult to measure - Emphasis on thresholds - Exclude transformation - Indicates system's dynamics - Mostly refers to persistence to change. - Close to adaptation capacity and adaptability.	- Is a higher order of thinking or frame of mind. - Is a holistic and overarching framework to govern the complex adaptive system. - Vulnerability and risks could be examined under resilience thinking framework. - It is theoretical, general and vague; different interpretations are allowed. - Mainly suitable for higher level decision/policy –making. - Includes transformation. - Indicates the dynamics of the whole governance arrangements. - Is forward-looking and aims to find windows of opportunities - Embraces change and risks. - Is not amenable to quantitative measurement.

Sources: Carpenter et al. (2001), Carpenter et al. (2005), Fazey (2010), Folke et al. (2002), Folke et al. (2010), Janssen et al. (2007), Walker et al. (2004), Walker et al. (2006), Walker & Salt (2012)

3.3.5. **Interpretations and applications of resilience and resilience thinking**

In this section, interpretations and applications of resilience and a resilience thinking framework will be examined in a number of research areas including: disaster management, urban planning, and social sciences. The purpose of this comparative analysis is to deliver a common understanding about how resilience and resilience thinking have been interpreted (or misinterpreted) and applied in different research contexts.

Resilience in disaster management

Definitions of resilience in the disaster management literature include speedy recovery (de Bruijne et al. 2010; Howes et al. 2015; Klein et al. 2003; Maguire & Hagan 2007); the capacity to mitigate, reduce or prevent risk (Comfort 1994; Cutter et al. 2010); and the capacity of recovery, adaptation, and transformation (Comfort et al. 2010; Paton & Johnston 2006) (Table 3.3). An analysis of the disaster management literature showed that the first two interpretations are more common than the third interpretation.

Paton and Johnston (2006) argued that the first two interpretations, which define resilience in a vulnerability context, prevent leadership recognising opportunities that could potentially emerge following system changes. In addition, Comfort et al. (2010) address another definition of resilience in disaster management literature that emphasises the capacity to "adapt, improvise and recover". Based on this interpretation, resilience is the capacity to prevent making a bad situation worse (Comfort et al. 2010).

The distinction between resilience and "reliability" was another significant consideration in the disaster management literature. While reliability refers to protective measures, resilience is the ability of recovery and bouncing back when protective strategies are not adequate or applicable (de Bruijne et al. 2010). Also, Zhou et al. (2010, p. 28) identify two different features of disaster resilience including "inherent resilience" and "dynamic resilience". Inherent resilience is the persistence capacity of a system before losing its function (Zhou et al. 2010). On the other hand, dynamic resilience is the capacity to recover from loss through learning and innovation (Zhou et al. 2010).

Resilience in urban planning context

A review of the application of resilience in the urban planning literature shows a diverse range of interpretations (Alberti & Marzluff 2004; Colding 2007; Davoudi et al. 2012; Schewenius et al. 2014). In some case, urban resilience was defined within a stability theory and an engineering context (Alberti & Marzluff 2004). However, the main interpretation has been developed in accordance with the SES discourse (Cartalis 2014; Davoudi et al. 2012; Pickett et al. 2004). While urban resilience was primarily referred to the recoverability and coping capacity, some researchers included transformability in the definition of the concept (Table 3.3).

For example, Alberti and Marzluff (2004) define resilience as “the size of the basin of attraction around a stable state, which defines the maximum perturbation that can be tolerated by the system without causing a shift to an alternative stable state”. In this regards, they argue that Ecological Resilience of Urban Ecosystems (ERUE) is “the degree to which they tolerate alteration before reorganizing around a new set of structures and processes”(Alberti & Marzluff 2004, p. 241). In addition, Cartalis (2014) addressed the links between resilience and urban sustainability and indicates the benefits of utilising resilience concept to introduce new foundations for urban sustainability. In this regard, resilience is the capacity to take benefits of newly-emerged opportunities, driven by external drivers, to reorganise and respond to future requirements (Cartalis 2014).

Resilience in social science

Cote and Nightingale (2012) identified the benefits of applying resilience thinking in social research and indicated that a resilience framework could bind social and environmental research. Similarly, Hatt (2013) argued for the positive contribution a resilience thinking framework can make to processes integrating of human and natural systems. The concept of social resilience borrows its key definitions from the ecological domain (Adger 2000; Berkes & Folke 1998). Social resilience is defined as the ability of social and human systems to actively adapt to negative impacts of drivers of change (Adger 2000; Maguire & Hagan 2007). Scholars address multidisciplinary features of social resilience including its economic, geographic (spatial) and social dimensions (Adger 2000; Berkes & Ross 2013).

Adger (2000) identifies two distinct concepts in social resilience. The first concept is “social vulnerability”, which refers to “exposure” of social systems to adversities of environmental and social changes. The other one is “environmental criticality”, which addresses an unsupportive availability or condition of resources that cause declines in the communities’ conventional lifestyle (Adger 2000). Norris et al. (2008) argue that social resilience is not an outcome. Resilience in a social context is a heuristic concept that indicates the process of successful adaptation (Norris et al. 2008).

Adger (2000) claims that social resilience should be studied at a community level. Community resilience is defined as “a process linking a network of adaptive capacities (resources with dynamic attributes) to adaptation after a disturbance or adversity” (Norris

et al. 2008, p. 127). Social capital, leadership, social communication, social cohesion, community involvement and social norms and values are indicated as attributes for evaluation of social resilience at a community level (Adger 2000; Adger et al. 2005; Anderies et al. 2006; Berkes & Ross 2013; Maguire & Hagan 2007).

In the social research domain, community resilience highlights the level of capacity to respond and adapt to the impacts from drivers of change and maintain an existing situation through recovery strategies (Norris et al. 2008; Sonn & Fisher 1998; Twigg 2009). In this regard, recovery and coping capacity are amongst the most common notions in a community and social resilience context (Table 3.3). Berkes and Ross (2013) identified two trends in defining the community resilience: the SES attitude; and the psychological attitude. The latter attitude emphasises "identifying and developing community strengths, and building resilience through agency and self-organization, with attention to people–place connections, values and beliefs, knowledge and learning, social networks, collaborative governance, economic diversification, infrastructure, leadership, and outlook"(Berkes & Ross 2013, p. 5).

Adger and Hodbod (2014) defined resilience as a feature of social systems, and its improvement is a matter of "normative and ethical" issue. Davoudi et al. (2012) argued that although some aspects of resilience thinking might be unappealing in social science, in general, it delivers a useful setting to integrate social and ecological concerns. Researchers have identified two major problems in applying a resilience thinking framework in social domains: unclear and contradictory definitions of the framework, and an inadequate focus on the characteristics of social organisations (Brown 2014; Olsson et al. 2015; Stone-Jovicich 2015). These issues will be analysed in Chapter 7.

Adaptability and transformability are two key features of a resilience thinking framework and resilience-based governance (Folke et al. 2010; Walker & Salt 2012). In the following sections, these two concepts would be scrutinised, and their implications for enhanced resilience capacity in coastal governance arrangements will be discussed.

Table 3.3. Definitions, interpretations and features of resilience in various literature and contexts

Context of interpretation/ application	Example of definitions and interpretation	Key concepts	Comments
Ecological	"The capacity of an ecological system to absorb change (mostly external change) and preserve its structure and functions" (Holling 1973a).	Capacity to absorb change, maintaining function and structure	In this domain, definitions of resilience have been evolved since its emergence in 1973. Compared with other domains (community, disaster, urban), there is more consistency in the definition, features and characteristics of resilience. Although the definitions have evolved over time, there is a general agreement on meaning and interpretation. In this regard, resilience is seen as a feature of an ecological system that refers to its capacity to keep its structure and function. On the other hand, the concept of stability (which has been labelled as engineering resilience (Holling 1996a), directly addresses spatial dimensions that refer to the position of the system in regards to its equilibrium/optimum state. In this domain, ecological resilience is mostly conceptualised by multiple stability domains rather than equilibrium states; transition, transformation and regime shift rather than return to a near equilibrium state; persistence to change rather than resistance; the extent of tolerable change, adaptive capacity and self-organising ability (Alcorn et al. 2003; Gunderson 2000; Gunderson & Pritchard 2002; Holling 1973b; Holling 1996b; Peterson 2000).
	Ecological resilience is about non-linear ecology, multiple stability domains and regime shifts (Holling 1996a)	Multiple stability domains, regime shift, non-linearity	
	1- "The amount of disturbance that an ecosystem could withstand without changing self-organized processes and structures (defined as alternative stable states)". 2- "Resilience in ecological systems is the amount of disturbance that a system can absorb without changing stability domains". 3- "Resilience is an emergent property of ecosystems and is related to the self-organized behaviour of those ecosystems over time" (Gunderson 2000).	Self-organising capacity, amount of tolerable disturbance, emergent property, maintain stability domain	
	"A resilient system is one that will retain the ability to reorganise and renew itself without loss of function or diversity when disturbed if disturbance is managed adaptively" (Alcorn et al. 2003)	Reorganising capacity, self-organising capacity, maintaining function, adaptive management of disturbance	
	Ecological resilience is "a characteristic of ecosystems to maintain themselves in the face of disturbance" (Adger 2000).	Maintaining capacity	
	Ecological resilience is adopted as "the capacity of ecosystems to absorb disturbances without undergoing fundamental change". "Resilience is often synonymous with adaptive capacity" (Drever et al. 2006).	Amount of tolerable change, no fundamental change, adaptive capacity	
	"the capacity of the system to absorb shocks and still maintain its functions" (Brand 2009).	Absorb shock, maintaining function	

Context of interpretation/ application	Example of definitions and interpretation	Key concepts	Comments
Social-Ecological Systems	"The magnitude of disturbance that can be tolerated before a socioecological system (SES) moves to a different region of state space controlled by a different set of processes".	A measure of tolerable disturbance, maintain state space	In the 2000s, resilience evolved from being a stand-alone concept to a framework or an approach. In this regard, resilience, together with adaptability and transformability are considered as three aspects of the resilience framework (Folke et al. 2010; Walker et al. 2004); but, still an approach within a sustainability domain (Carpenter et al. 2005; Walker et al. 2004). The main development in SES resilience was including the concept of transformation within the resilience framework.
	"Maintaining the functionality of a system when it is perturbed, or maintaining the elements needed to renew or reorganize if a large perturbation radically alters structure and function" (Walker et al. 2002).	Maintain functionality, renewing, reorganising	
	"The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker et al. 2004).	Absorb disturbance, maintaining function and identity	
	"A core idea emerging from resilience theory is that complex systems such as SESs organize around continuous change" (Janssen et al. 2007).	Reorganising	
	"Resilience thinking" is a holistic approach to integrating three concepts of "resilience, adaptability and transformability (Folke et al. 2010).	Resilience thinking, adaptability, transformability, resilience	
	"Capacity of a system to persist against change, the ability of perpetual adaptation to complex dynamics and also the capacity to transform to a new pathway" (Rockström et al. 2014).	Persist against change, perpetual adaptation, transformation	
	Resilience is defined as: a) The extent of disruption which could be absorbed by a system while staying in the same stability domain; b) the degree of self-organisation capacity of the system; and c) the ability of a system to learn and adapt (Cumming et al. 2013).	Tolerable disturbance, self-organising capacity, adaptability, learning	

Context of interpretation/ application	Example of definitions and interpretation	Key concepts	Comments
Disaster management	"Resilience is a measure of how well people and societies can adapt to a changed reality and capitalise on the new possibilities offered" (Paton & Johnston 2006).	Measure, adapt, capitalise new possibilities, adaptive capacity, learning and growth	In disaster research, resilience is mainly seen as in a vulnerability context, and three major interpretations of resilience are evident: - Resilience as speedy recovery, specific resilience and engineering resilience (de Bruijne et al. 2010; Klein et al. 2003; Maguire & Hagan 2007) - Resilience as the capacity of the system to mitigate, reduce or prevent risk (Comfort 1994; Cutter et al. 2010) - Resilience as a wider capacity for recovery, adaptation and/or transformation (Boin et al. 2010; Paton & Johnston 2006) The first two notions of resilience are more prominent than the others
	Resilience generally applies to aftershock situations. In this context, resilience is defined as "the last line of defence separating a stricken community from structural demise or even extinction" In this regard, resilience is interpreted as the capacity of "speedy recovery" when a disaster has already occurred. In contrast, in studies of "organisations in flux", resilience means the capacity of the system to prevent the disaster from taking place. This definition is interpreted as "*timely adaptation*" (Boin et al. 2010).	Speedy recovery, defensive, timely adaptation, preventive strategies	
	"Resilience is the ability of the system to absorb the magnitude of catastrophe and recover when a disaster takes place". In this regard, there is a distinction between resilience and "reliability". While reliability mostly refers to protective measures, resilience is the ability for recovery and bouncing back when protective strategies fail (de Bruijne et al. 2010).	Recovery, bouncing back, aftershock capacity	
	As a specific attribute of a system, resilience refers to 1) degree of the stress that a system can absorb and stay in the same domain of attraction; and, 2) the level of self-organising capacity of a system. In another term, resilience is the attributes of a system which influence its adaptive capacity (Klein et al. 2003).	Absorb perturbation, maintain domain of attraction, self-organising capacity	
	Resilience, as a central concept in disaster management, refers to "the capacity to resist and recover from loss". In this regard, "disaster resilience is "the capacity of Hazard –Affected Bodies (HABs) to resist loss during a disaster and regenerate and reorganise after the disaster in a specific area and in a given time".	Capacity to resist losses, regeneration, reorganisation	

Context of interpretation/ application	Example of definitions and interpretation	Key concepts	Comments
Urban planning	the concept of resilience refers to "the size of the basin of attraction around a stable state, which defines the maximum perturbation that can be tolerated by the system without causing a shift to an alternative stable state" (Alberti & Marzluff 2004).	Maximum tolerable perturbation, maintaining stable sate	While most of the literature in disaster research addresses resilience as a reactive concept in the vulnerability domain and engineering context, in urban planning literature, it is mostly adopted in relation to SES framework. However, in some cases, the concept of resilience has been adopted equivalent to resistance to shocks and ability to recover after being disturbed.
	Resilience is defined in its ecological concept as "the capacity of an ecosystem to absorb disturbance and reorganize while undergoing a change so as to retain essentially the same function, structure, identity and feedbacks " (Colding 2007).	Ecological resilience, absorb disturbance, reorganising, retain function, identity, and feedbacks	
	"the capacity of a system to absorb disturbance and change while still retaining essentially the same identity (Schewenius et al. 2014).	Maintain identity, absorb disturbance	
	"Resilience is not conceived of as a return to normality, but rather as the ability of complex socio-ecological systems to change, adapt, and, crucially, transform in response to stresses and strains" (Davoudi et al. 2012).	Change, adapt, transform,	
	Based on its ecological notion, resilience is defined as "the ability of a system to adapt and adjust to changing internal or external processes". The concept of "cities of resilience" suggests long-term flexibility in urban planning (Pickett et al. 2004).	Adapt, adjust, change, flexibility	
	"Resilience is not just a response to external shocks but also the capacity to reorganise, take advantage of new situations and respond to new requirements" (Cartalis 2014).	Reorganising, take advantage of new situations, respond to new requirement	
	Two different forms of resilience: a) a-Resilience which is the ability to survive shocks; and b) b-Resilience which is the ability to change the events of outside shock (Polèse 2010).	Survive, change, shock	
	Resilient cities are "Such cities are capable of withstanding severe shock without either immediate chaos or permanent deformation or rupture. Designed in advanced to anticipate and recover from the impacts of natural or technological hazards, resilient cities are based on principles derived from past experience with disasters in urban areas" (Godschalk 2003).	Withstand shock, maintain structure, anticipate, recover, learning	

Context of interpretation/ application	Example of definitions and interpretation	Key concepts	Comments
Social science	"Community resilience is a **process** linking a network of adaptive capacities (resources with dynamic attributes) to adaptation after a disturbance or adversity" (Norris et al. 2008).	Adaptation, adaptive capacity, robustness	In community domain, resilience was mainly adopted in its physical and specific definition (ability to recover and bounce back). The idea of development and transformation are not obvious in this literature. There are two different kinds of argument in this domain: most see (community) resilience as an outcome or physical concept; a few viewpoints define that as an umbrella concept or approach. Resilience is mostly seen as a response and proactive. It is mostly used in a combination of terms such as risks, hazards, and adaptive capacity. There are two different forms of resilience: resilience as elements of the vulnerability approach and resilience as a concept in the resilience thinking approach. In the domain of "community resilience", resilience is seen as an element of vulnerability.
	Social resilience is "the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change" (Adger 2000).	Coping capacity, external stresses, disturbance, environmental change	
	Resilience refers to: a) "The positive ways in which people respond to adversity and stressful life events". b) " successful adaptations to adversity, stressful events, and oppressive systems"(Sonn & Fisher 1998).	Positive response, successful adaptation	
	Community resilience refers to: a) "Anticipate, minimize and absorb potential stresses or destructive forces through adaptation or resistance, b) manage or maintain certain basic functions and structures during disastrous events, c) recover or 'bounce back' after an event" (Twigg 2009).	Anticipate, minimise, adaptation, resistance, maintaining functions, recovery, bouncing back, coping capacity, disaster resilience and resistance	
	"Community resilience encompasses individual preparedness as well as establishing a supportive social context in communities to withstand and recover from disasters" (Plough et al. 2013).	Preparedness, recovery, community cohesion,	
	The ability of a social system to "respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to reorganize, change, and learn in response to a threat"(Cutter et al. 2008).	Respond, recover, absorb impact, coping capacity adaptiveness, reorganise, learn	
	Resilience "explains the responses of communities to events such as disasters" and their ability to "bounce back from severe disaster" (Sherrieb et al. 2010).	Response, bounce back	
	"Community resilience is ''the existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise'' (Magis 2010).	Uncertainty, unpredictability, surprise	

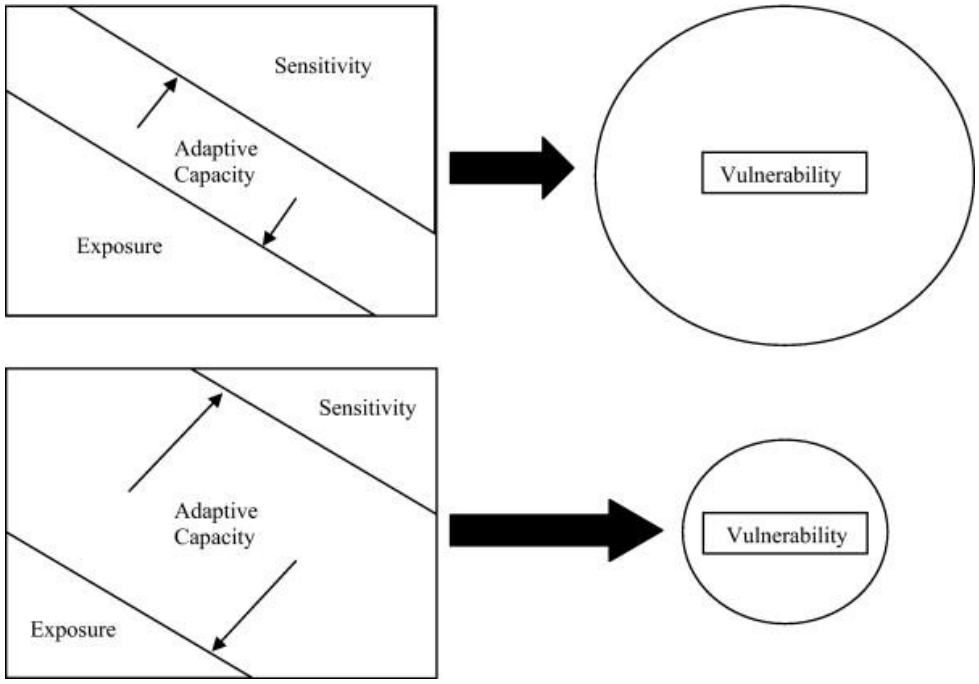
3.4. Adaptability and adaptation capacity

The concepts of adaptation, adaptability and adaptive capacity have been applied to various areas of research including science, engineering and social studies (Brooks 2003; Conrad 1976; Dobzhansky 1968; Hill 2013; Smit & Wandel 2006; Wellstead & Zarrop 1991). Over the last few decades, with an increasing body of literature in the climate change domain, these concepts have been in the forefront of environmental research and coastal studies (Brooks 2003; Pelling 2010; Smit et al. 1999).

Adaptation and adaptability originated from biological science. Dobzhansky (1968) maintains that adaptability is the "ability" of a system to adapt; adaptation is the process of adapting, and "adaptedness" is the status of being adapted. Adaptedness is different from adaptability. A system could be in a highly adapted status to its environment whereas its ability to adapt to changes could be low. Adaptedness is a measurable concept and could be quantified (Conrad 1976; Dobzhansky 1968). In an ecological domain, adaptability indicates the level of flexibility that assists an organism to survive and evolve (Holling 1973a). Researchers also address the concept of "adjustment" - especially in a climate change context (Smit et al. 1999; Smit & Pilifosova 2003). Although adjustment has been used synonymously with adaptation, the concept basically refers to the procedure of adapting to stable and less chaotic conditions when external changes are gradual and predictable (Brooks 2003; Gallopín 2006; Smit et al. 1999; Smit & Wandel 2006).

The concepts of adaptability and adaptive capacity have been widely applied synonymously in both vulnerability and resilience thinking contexts (Carpenter & Brock 2008; Engle 2011; Gallopín 2006). Adaptability (Figure 3.9) is a key concept to reduce system vulnerability (Brooks et al. 2005; Smit & Wandel 2006; Tol & Yohe 2007) and increase their resilience (Folke et al. 2010; Walker et al. 2004).

Figure 3.9. Adaptive capacity in vulnerability context



"A basic depiction of adaptive capacity's role in influencing vulnerability. Adaptive capacity affects a system's vulnerability through modulating exposure and sensitivity". Source: Engle (2011).

Adger (2006) defines vulnerability as "the absence of capacity to adapt". According to this interpretation, a vulnerable system is incapable to effectively adapt to its changing environment (Adger 2006; Gallopín 2006). Smit and Wandel (2006, p. 282) identify adaptive capacity as the coping capacity to "manage or adjust to some changing condition, stress, hazard, risk or opportunity". So, adaptive capacity is perceived as the ability (of mainly social systems) to purposefully "bear and share" losses and maintain and improve the quality of existence (Gallopín 2006; Smit & Pilifosova 2003).

Within a resilience framework, adaptability relates to the resilience capacity of a system. Folke et al. (2010, p. 1) indicated that "adaptability is part of resilience capacity. It represents the capacity to adjust responses to changing external drivers and internal processes and thereby allow for development along the current trajectory (stability domain)". In this respect, a resilient SES is considered as one that has a substantial level of adaptability (Folke et al. 2010; Walker et al. 2004). Walker and Salt (2012) indicate that adaptability is the ability of an SES to manage its resilience within the existing domain of attraction.

Adaptability in biological and ecological systems is mainly reactive and is influenced by genetic and biological factors (Carpenter et al. 2001; Smit & Pilifosova 2003). In contrast, adaptability of an SES could be deliberate and is mainly influenced by the social parameters (Adger 2006; Walker et al. 2004). Scholars argue that the quality and extent of SES adaptability depends on the availability of adaptive institutional arrangements (Allen & Holling 2010; Berkes & Jolly 2002; Scheffer 2009).

The analysis of the literature showed that the concept of adaptation, especially in the vulnerability and climate change domain, has been largely used in a defensive, preventive and preservative notions (Smit et al. 1999; Smit & Wandel 2006). In this regards, Pelling (2010) maintains that adaptation mainly focuses on losses and threats than gains and opportunities; therefore, the argument around "what can be reformed or gained" has been not well developed in climate change adaptation literature.

Although adaptability and adaptive capacity have been used almost synonymously in the vulnerability domain, their deployment in resilience thinking has been more nuanced. In a resilience thinking framework, with the recognition that adaptation and transformation are distinct concepts, adaptive capacity does not merely refer to the adaptability of an SES. In this regard, some argue that while adaptation strategies mainly refer to coping capacity, adaptive capacity addresses both adaptation and transformation capacities (Berman et al. 2012; Pahl-Wostl et al. 2010; Walker et al. 2004).

In dealing with complex adaptive systems in a changing environment, institutional adaptive capacity is the instrument to enhance social adaptability (Gupta et al. 2010). Gupta et al. (2010, p. 460) refer to "conservative" and "reactive" nature of institutions and define them as "systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of the relevant roles". In this regard, Gupta et al. (2010, p. 461) described institutional adaptive capacity as "the inherent characteristics of institutions that empower social actors to respond to short and long-term impacts either through planned measures or through allowing and encouraging creative responses from society both ex-ante and ex-post".

To avoid confusion, in this research the term adaptability indicates adaptation capacity; the specific ability of an SES to adapt without fundamentally changing its constituting state. Further, resilience capacity will be utilised to refer to adaptiveness, which is the capacity of an SES to change its stability state and transform if adaptation strategies are not adequate or applicable.

3.5. Transformation and transformability

Human actions impact Earth systems in two ways. Scientific progress and technological innovation are expanding the thresholds of Earth systems and consequently broadening their stability domains and resilience. In contrast, adverse impacts of human development are shrinking stability domains, and SESs are moving towards their thresholds. Research shows that impacts of human development are dominant over scientific progress and technological innovation (Walker & Salt 2006). Thus, many of the social and ecological systems are approaching thresholds of their stability domains. Rapid environmental changes have increased the uncertainty and randomness of undesirable events (Holling 1973a). This uncertainty has exacerbated the impacts of adverse low-probability events on behaviours and functions of SESs (Taleb 2010; Walker & Salt 2006).

In the face of accumulated effects of incremental change, many of conventional adaptation strategies are not applicable or adequate (Anderies et al. 2006; Folke et al. 2010; Walker & Salt 2006). In comparison to gradual changes, which need “incremental adaptation” strategies, radical changes require different responses. Thus, there is a need for developing a new form of capacity that allows (or encourages) SESs to cross the thresholds in a way that minimises loss of value and takes advantage of new opportunities (Armitage & Plummer 2010; Kates et al. 2012).

The change in a stability domain is called “regime shift” and the ability to do that requires “transformation capacity” (Walker & Salt 2012; Walker & Salt 2006). Transformation is defined as a fundamental change of system’s structure and function due to an alteration in the attributes of the system (Folke et al. 2010; Walker et al. 2004). The capacity to undertake the fundamental change is called “transformability” or transformation capacity (Folke et al. 2010; Kates et al. 2012; Pelling 2010). Transformation reflects the ability of a system to absorb changes by making significant modifications in its structure, functions, and

identity (Folke et al. 2010; Walker & Salt 2012). In other words, transformability is the capacity of a system to make (or find) new opportunities in crisis, unlock a situation, move away from an undesirable condition and create new trajectories for development (Armitage & Plummer 2010; Folke et al. 2010; Walker & Salt 2012).

A review of the literature showed a variety of interpretations of transformation concepts. One interpretation defines transformation as unwanted, unexpected, reactive and unintentional changing of the stability domain mostly toward an undesirable one (Folke et al. 2002). In that context, the transformation was not seen as a positive ability or deliberate "capacity". Over time, the idea of transformation developed to address a particular capacity of SESs to undergo a deliberate regime shift and improve their functionality (Folke et al. 2010; Walker et al. 2004; Wescott 2012).

The aim of transformation capacity is not to enhance the efficiency and productivity of SESs, but to improve diversity, innovation, flexibility and effectiveness. Researchers indicated that an SES should be able to develop responsive transformative strategies before it is too late (Pelling 2010; Walker & Salt 2006). Developing system transformability could take place in several ways: establishing new stability domain; shrinking the existing stability domain; introducing new constituting attributes; changing the scale/level of the systems in a panarchy; and establishing cross-sectoral/scale linkages with other SESs (Folke et al. 2010; Pelling 2010; Walker 2005).

Depending on the context, there are two types of transformation: proactive, deliberate, active, planned or purposeful transformation; and reactive forced transformation (Folke et al. 2010; Wilson et al. 2013). Proactive transformability is the ability of the human system to intentionally change its stability domain when the SES is locked-in an undesirable condition (Walker & Salt 2012; Wilson et al. 2013). Reactive transformability is the capacity of a system to fundamentally change the function when it is forced to cross the thresholds or when the system is already moved to another domain of attraction (Folke et al. 2010; Walker 2005).

Social scientists indicate that there is a distinct difference between "adaptive maintenance" and social transformations. Adaptive maintenance is when a social system attempts to preserve its identity and function. Social transformations are deliberate processes of

profound changes in social values and lifestyle (Wilson et al. 2013). For example, Marshall et al. (2012) argue that while some factors such as a sense of belonging to place are central to improve adaptation strategies they could have a negative impact on social transformability.

Lengnick-Hall and Beck (2005) argue the concept of "robust transformation" as a necessary requirement for institutional arrangements to deal with environmental uncertainty and dynamic. They define robust transformation as a "deliberately transient, episodic response to a new, yet fluid, environmental condition. Robust transformation enables a firm to capitalize on environmental" (Lengnick-Hall & Beck 2005, p. 742). Finally, Westley et al. (2013) argue the requirement for development of "a new theory of transformative agency". They indicate the necessity of transformation capacity and "strategic agency" to present novelty and transformation possibilities when the system is constantly changing (Westley et al. 2013).

The differences between adaptation and transformation capacities and the attributes that form and constitute them are not clear. Although adaptability and transformability are two distinct features of a resilience framework, they are strongly interconnected (Armitage & Plummer 2010; Folke et al. 2010). Scholars argue convergences and divergences in adaptation and transformation capacities (Armitage & Plummer 2010; Walker et al. 2004; Walker & Salt 2012). While some researchers do not see clear differences between them (Kates et al. 2012; Pelling 2010), others argue adaptation and transformation as two distinct capacities of SESs (Walker et al. 2004; Walker & Salt 2012).

For example, Kates et al. (2012) integrated adaptation and transformation capacities and address to the concept of "transformational adaptation". They referred to transitional or intermediate adaptation that indicates strategies that are incremental to some scales and transformational to others (Kates et al. 2012). Also, Kates et al. (2012) indicated that long-term incremental adaptability could potentially lead to increases in transformation capacity. Walker and Salt (2012) similarly argued that transformational changes on smaller scales could improve adaptation capacity and resilience on larger scales (Walker & Salt 2012).

Although adaptability and adaptation capacity, are common concepts in the vulnerability and the resilience literature (Engle 2011; Gallopín 2006), transformation capacity is largely

specific to the resilience thinking domain. While adaptation capacity refers conservative aspects of SES governance, transformability reflects an entrepreneurial and risk-taking feature of SES resilience (Folke et al. 2010). As with adaptation capacity, transformation capacity mainly depends on social parameters (Folke et al. 2010; Wilson et al. 2013). Although the attributes that define adaptability and transformability are not fully clear, identification of these attributes is subjected to growing number of studies (Folke et al. 2010; Walker 2005). Folke et al. (2010) claim that attributes of transformation capacity are similar to those in general resilience and adaptive capacity.

3.6. Resilience-based coastal governance and related attributes

In the last two decades, the concepts of resilience and resilience capacity have become central in the environmental governance debates (Davoudi 2016; Folke 2007). Duit et al. (2010, p. 365) suggest that developing a governance arrangement based on resilience thinking is the best way of "fighting complexity with complexity". With the incorporation of a resilience thinking framework into environmental governance literature, terms that have developed to indicate good governance arrangements in accordance with resilience thinking include "adaptive governance" (Dietz et al. 2003; Duit et al. 2010; Walker et al. 2004); "resilient governance" (Termeer et al. 2011); resilience governance (Walker 2005) and "resilience-based governance" (Garmestani & Benson 2013). "Adaptive governance" is a popular term in the scholarship to address systems adaptiveness. Nevertheless, this term could raise some semantic confusion by giving undue emphasis to a requirement for adaptation capacity and undermine the necessity for system transformability. In addition, the term "resilient governance" implies a mode of governance that is resilient (as oppose to vulnerable). This interpretation defines resilience as a property of governance arrangements, and could, therefore, raise the question of resilient to what? In this respect, the term resilient governance could lead to an understanding of resilience that is closer to engineering definition and specific resilience. Specific resilience delivers a narrower understanding of resilience that is not the focus of this research.

In order to address the features, characteristics, dimensions and scale of desirable coastal governance arrangements, this study adopts Garmestani & Benson's (2013) concept of resilience-based coastal governance. A resilience-based coastal governance is not a structure that is resilient. This form of governance underlines a mode of governance in

which resilience thinking is the main framework for coastal decision-making, policy development, planning and management. A resilience-based coastal governance is able to develop an appropriate capacity to make both adaptational and transformational decision-making.

Folke et al. (2005, p. 441) indicate that adaptive governance[4] "connects individuals, organizations, agencies, and institutions at multiple organizational levels". They maintain that adaptive governance enhances institutional "self-organising" capacity and facilitates inclusion of social and ecological values in the governance processes (Folke et al. 2005). In addition, Walker et al. (2004, p. 7) claim that adaptive governance is the "process of creating adaptability and transformability in SES".

Resilience-based coastal governance refers to collective and collaborative mechanisms that holistically embrace the complexity and dynamics of SESs and deliver responsive strategies to enhance their resilience, adaptability and transformability (Chaffin et al. 2014; Dietz et al. 2003; Folke et al. 2005; Olsson et al. 2006; Walker et al. 2004). A governance arrangement based on a resilience thinking framework is nested in adaptive cycle setting and panarchy (Folke et al. 2005; Garmestani & Benson 2013).

Moreover, a resilience framework offers a new form of rationality for environmental governance (Davoudi 2016). Conventional environmental governance approaches are often based on simplistic attitudes which are driven by the idea of "learning from past experiences" (Davoudi 2016; Ostrom et al. 1999). Ostrom et al. (1999) maintain that with increasing speed by which drivers of change reshape systems, it can be ineffective to use past experiences to inform future decisions. Walker (2005, p. 77) further argues that a "resilience governance" is "concerned with learning how to avoid (or to cross) thresholds between alternate regimes and how to influence the positions of the thresholds".

A resilience-based coastal governance is able to navigate changes; assess the existing situation (where we are?); evaluate alternative scenarios; make a decision about future trajectories (where to go?); and develop and implement strategies to progress towards new

[4] The underpinnings of resilience-based governance, as it was defined in this research, are similar to adaptive governance. The main reason for adopting resilience-based governance is its terminological and semantic clarity.

trajectory (how to go?) (Armitage & Plummer 2010; Folke et al. 2010; Walker 2005). A resilience-based coastal governance requires a preparation phase to get ready for change; a transition phase to progress from old (or existing) conditions towards a new trajectory; and a phase in which resilience of a system is established around a new stability state (Olsson et al. 2006).

The complexity and breadth of resilience-based (adaptive) governance hinder its implementation in the real world. Hence, the sophistication of practising adaptive governance could be facilitated through adaptive management process (Folke et al. 2005). On the other hand, Folke et al. (2005) indicate that adaptive management mainly concerns about the incorporation of "ecological knowledge" into management approaches, whereas resilience-based governance is associated with considering multi-dimensional realism in problem-solving and conflict resolution processes (Folke et al. 2005).

The potential benefits of applying resilience-based coastal governance include: better understanding of complexity and dynamics of wicked environmental problems; improving the quality of knowledge system and informed decision-making; enhancing institutional flexibility; establishing polycentric governance arrangements; developing an intersectional and cross-scale partnership, collaborations and communications; enhancing the capacity to manage uncertainty and rapid changes; increasing effectiveness of public engagement processes; and enhancing the level of leadership visions and strategy (Folke et al. 2005; Mitchell et al. 2015).

A resilience-based coastal governance requires resilience capacity. Determination of an appropriate set of attributes that create or enhance resilience capacity in a governance arrangement is challenging. These attributes should address the key features of coastal SESs such as resilience, adaptability, and transformability (Folke et al. 2010; Walker et al. 2004). Also, the attributes should respond to the complexity of interacting social, economic, political and ecological drivers. The following paragraphs examine potential attributes that are addressed in the literature.

Resilience-based governance is neither top-down nor bottom-up. It is panarchial. Folke et al. (2005) indicate the necessity of balanced power-sharing mechanisms in which accountabilities and responsibilities are well distributed. This type of governance structure

requires polycentric and multi-scalar organisational arrangements that are communicative (Folke et al. 2005). In addition, Dietz et al. (2003) argued that an adaptive governance framework should improve the following three principles: “analytic deliberation”, where a robust communication between science, policy-making, and public interest is developed; “nesting”, where a balanced polycentric institutional arrangement is holistically dealing with complexity; and “institutional variety”, where a combination of different types and levels of organisations with different values work collectively and collaboratively.

A resilience-based governance arrangement should be flexible to allows for development, learning, novelty, adaptability and transformability (Duit et al. 2010; Folke et al. 2005). A level of stability is also needed for long-term planning, developing cross-scale interactions and facilitate collaboration and partnership (Duit et al. 2010). In a highly transformative situations, adaptive cycle process assists systems to learn and develop (Folke et al. 2002). There is a requirement for flexible institutions and polycentric governance arrangements that are open to uncertainty and capable of developing adaptability through learning and monitoring process (Folke et al. 2002). Institutional arrangements that are flexible accumulate knowledge, develop problem-solving mechanisms, and allow novelty and innovation (Allen & Holling 2010; Berkes & Jolly 2002; Scheffer 2009).

Folke et al. (2005) refers to the self-organising capacity of a resilience-based governance and indicates trust, vision, learning, leadership, social network, conflict resolution, and knowledge system as essential attributes for enhancing resilience capacity. They also mention that mediating institutions could facilitate cross-scale collaboration, partnership, and communication (Folke et al. 2005).

Lockwood et al. (2010) indicate that “self-reflexivity” or “meta-learning” could deliver a quality knowledge base for a resilience-based governance system. They also address the adaptive management cycle to enhance the effectiveness of adaptive governance processes. Appropriate knowledge systems, availability of financial and human resources, diversity of functions, knowledge and learning sources, are also indicted as attributes for developing a resilience-based governance (Armitage & Plummer 2010; Folke et al. 2010; Olsson et al. 2010; Pahl-Wostl et al. 2013; Walker 2005). Table 3.4 summarises the attributes and requirements of a resilience based-governance arrangement.

Table 3.4. Attributes and requirements for resilience-based governance from the literature

Resilience based-governance accounts for:	Attributes/characteristics/requirements	Area of research/reference
Adaptability, transformability, resilience, self-organising capacity, legitimacy, accountability, polycentric institutional arrangements, multi-scalar	leadership, social capital, vision, learning, collaboration, participation, collective action, conflict resolution, supportive legislation, adaptive co-management, Bridging organisation,	SES resilience (Folke et al. 2005)
Transformation, resilience	Leadership, networking, building knowledge	SES resilience (Olsson et al. 2006)
Adaptability, change, resilience	enabling legislation, economic incentives and by bridging organisations that connect institutions across levels, learning	SES, global change (Folke 2007)
Polycentricity, resilience	Multi-level institutional arrangement, cross-scale connections, panarchy, co-management, place-based management, active participation	Resource/ecosystem management (Brondizio et al. 2009)
Adaptability, acknowledging uncertainty and change	Quality and availability of information, knowledge about values, conflict resolution mechanisms, public participation, supportive regulatory framework, financial resources, institutional capacities, infrastructures and technology	Resource management (Dietz et al. 2003)
Resilience, panarchy, dynamics	Enhancing public and privet partnership (through participation, collaboration, and partnership), improving local communities' capacity for self-management of resources, cross-scale institutional capacity building (skill transfer, learning capacity)	Coastal management (Olsen 2003)
Adaptability, resilience, dynamics, flexibility	Reflexive legal framework, innovative and flexible legal system, adaptive management	Coastal management (Garmestani & Benson 2013)
Resilience, adaptation, transformation, scale mismatch and the problem of fit	Adaptive management, polycentricity, diversity and complexity	(Chaffin et al. 2014))
Complexity, change, uncertainty, dynamics, adaptability, diversity of values	Knowledge system, learning, self-reflexivity", transparency, legitimacy, accountability, inclusiveness, fairness, adaptive management cycle-monitoring and evaluation, cross-scale interactions and connectedness, resources, human skill	Natural resource management/ (Lockwood et al. 2010)
Resilience, change, ethical concerns	System understanding, network, and learning; values, institutional forms; leadership a; resources; informed decision-making, cross-level power distribution, governance polycentricity; governance legitimacy; conflict resolution mechanisms; transparent decision-making mechanisms; clear vision, decision-making integrity;	Marine biodiversity conservation (Lockwood et al. 2012)

Resilience based-governance accounts for:	Attributes/characteristics/requirements	Area of research/reference
Resilience, regime shift, complexity, uncertainty, rapid change, novelty	Learning, experimentation, and discovery (entrepreneurship), flexible vision, leadership	Ecological restoration-water regime governance (Gunderson & Light 2006)
Institutional fit, scale mismatches, change, adaptability, transformability	Flexibility, learning capacity, quality of knowledge systems, accountability and legitimacy of decision-makers, collaborative and participative decision-making, distribution of roles and responsibilities, vision, institutional cooperation, and partnership, transparent decision-making	Conservation practice (Armitage et al. 2012)
Complicity, uncertainty, system dynamic, institutional polycentrism	Effective public engagement, social capital, supportive political will, Leadership vision, quality of knowledge system, adaptive management, organisational cooperation, and partnership, supportive regulatory framework	Biodiversity conversation (Mitchell et al. 2015)
Resilience, uncertainties, dynamic	Participation, polycentricity, accountability, multi-layered, knowledge diversity, learning	Multi-disciplinary/ (Lebel et al. 2006)

For this research, a set of attributes was needed to identify the represent resilience capacity of Tasmanian coastal governance. An initial set of 21 attributes were identified to represent the requirements of developing a resilience-based-Tasmanian coastal governance. This list was subsequently refined and synthesised into 16 essential attributes to inform the development of a resilience-based Tasmanian coastal governance arrangement and its resilience capacity (Table 3.5).

Table 3.5. Attributes for resilience-based Tasmanian coastal governance

	Attribute	Definitions/descriptions	Supporting sources
1	**Knowledge acquisition mechanisms**	Mechanisms to collect or generate knowledge from a range of disciplines and sources, including scientific, political, economic, social, cultural, traditional and local knowledge	(Dietz et al. 2003), (Hahn et al. 2006)
2	**Knowledge management processes**	Processes that store and deliver knowledge, while controlling quality and ensuring currency	(Lockwood et al. 2010), Mitchell et al. (2015)
3	**Knowledge sharing mechanisms**	Mechanisms that ensure knowledge is shared with other actors	(Elbakidze et al. 2010), (Berkes 2009)
4	**Diversity of expertise**	Availability of personnel skilled in environmental, social and economic matters of relevance to the coastal zone	Armitage & Plummer (2010), Lengnick-Hall & Beck (2005)
5	**Institutional flexibility**	Ability of organisational structures and processes to change in response to changing internal or external conditions	Folke et al. (2005), Mitchell et al. (2015), Duit et al. (2010), Armitage et al. (2012)
6	**Institutional learning**	The capacity of the institution to learn from previous experience, as well as from consideration of plausible futures, challenges and response options	Armitage et al. (2012), Pahl-Wostl (2009), (Lengnick-Hall & Beck 2005)
7	**Leadership for change (entrepreneur leadership)**	Leadership on coastal issues that promotes innovation and identifies strategies that take advantage of new opportunities	Lengnick-Hall & Beck (2005)
8	**Leadership for securing outcomes**	Leadership that works to secure wide political and community support for coastal management strategies, and resources to implement these strategies	Folke et al. (2005), Lockwood et al. (2012), Olsson et al. (2006)
9	**Transparent decision-making processes**	Decision-making processes for coastal issues that allow stakeholders to see what decisions are being made, as well as the rationales for these decisions	Armitage et al. (2012), Lockwood et al. (2012)
10	**Stakeholder engagement processes**	Engagement processes for coastal issues that use appropriate methods to allow and encourage all stakeholders to contribute to decision-making	Lebel et al. (2006), Brondizio et al. (2009), Folke et al. (2005)
11	**Conflict resolution mechanisms**	Mechanisms that provide effective means to address conflicts within the organisation, and with external stakeholders	Folke et al. (2005), Lockwood et al. (2012), Dietz et al. (2003)
12	**Partnerships**	Collaborative arrangements with other governance authorities and stakeholder organisations that address coastal issues	Duit et al. (2010), Folke et al. (2005), Mitchell et al. (2015), Olsen (2003)

	Attribute	Definitions/descriptions	Supporting sources
13	**Institutional connectedness and coordination**	Processes and agreements that foster connections and coordination across multiple levels and scales of coastal governance	Duit et al. (2010), Folke et al. (2005), Mitchell et al. (2015), Lockwood et al. (2010)
14	**Supportive legislation**	Legislation relevant to the coast that establishes goals, processes, and standards while allowing flexibility to respond to change	Mitchell et al. (2015), Garmestani & Benson (2013), Folke et al. (2005)
15	**Distribution of power**	Arrangements that distribute power across multiple levels and scales of coastal governance (indicates cross-level accountability)	Folke et al. (2005), Armitage et al. (2012), Lockwood et al. (2012)
16	**Adaptive planning and management cycle**	Processes that set measurable objectives, identify and implement strategies to achieve these objectives, monitor outcomes, adjust knowledge based on evidence from monitoring, and foster improved performance over time	Folke et al. (2002), Walker (2005), Folke et al. (2005), Lockwood et al. (2010), Chaffin et al. (2014)

3.7. Chapter summary

This chapter argued the drawbacks of conventional environmental management approaches in dealing with complex adaptive systems and the uncertainty of rapid social and environmental change. In this regard, new environmental governance was indicated as an appropriate pathway to go beyond scientific and technical issues and account for social and political values. It was argued that good governance could assist incorporation of social concerns and human-oriented values and into coastal decision-making and policy development.

In addition, SESs and resilience thinking were examined as potential appropriate frameworks to assist in developing responsive coastal governance arrangements. Resilience thinking was identified as an effective and overarching framework to deal with the complexity and dynamics of coastal SESs in an uncertain and rapidly changing world. With the combination of environmental governance, SES framework and resilience thinking, the concept of resilience-based coastal governance was introduced as a desirable form of coastal governance in Tasmania. Resilience-based governance is forward-looking and has the capacity for adaptational and transformational decision-making. Such coastal governance encourages an entrepreneurial and risk-taking attitude that facilitates setting long-term visions and flexible mechanisms to deal with change, complexity, and uncertainty. Drawing on an extensive literature analysis, the chapter concluded by recommending 16 attributes that could potentially enhance resilience capacity of governance systems and facilitate the development of resilience-based coastal governance.

Chapter 4. **Tasmanian coastal governance arrangements**

The purpose of this chapter is to describe the Tasmanian coastal SES and identify the key features that influence coastal decision-making and policy development in the State. The analysis aims to deliver an overall understanding of the Tasmanian governance regime, with a particular focus on coastal environments, to inform more in-depth investigations and evaluations in the subsequent Chapters 5 and 6.

In accordance with the objectives of the research, this chapter focuses on identifying the main influential organisations and the major mechanisms or instruments that those organisations could potentially use to influence the processes of coastal governance. Although the researcher is aware of the limitations of many of these organisations and mechanisms, assessing their effectiveness and evaluating related organisational performance is beyond the scope of this chapter. An evaluation of the Tasmanian coastal governance regime, according to the objectives of the thesis, will be provided in Chapters 5, 6 and 7.

To accomplish the aim and objectives of this research, the chapter briefly identifies the main influential organisations and describes the major legislation, policy and planning frameworks. The first part of the chapter commences with a review of the federal (national) level organisations and the mechanisms by which they influence the process of Tasmanian coastal governance. This will be followed by an examination of the role of the Tasmanian State Government in relation to coastal decision-making and policy development. Finally, the governance arrangements at regional and local levels will be considered.

4.1. National level

The Australian Government influences coastal governance processes through statutory instruments as well as guiding policies and strategies. In addition, the Australian Government has a role in providing technical and financial support. The key federal level influences on Tasmanian coastal governance, including Australia's international commitments, influential organisations and legislation, policy and planning frameworks, are discussed below.

4.1.1. **Australia's international commitments**

According to Section 51 (xxix) of the Australian Constitution, the Federal Government is the accountable body to ratify, enforce and monitor the implementation of international agreements, treaties and conventions. The Australian Government is responsible for ensuring that the decisions at other levels do not conflict with Australia's international commitments. Agreements, treaties and conventions relevant to Tasmanian coastal areas are summarised below.[5]

Convention on Biological Diversity

The Convention on Biological Diversity (CBD) was developed by the United Nations Environmental Program (UNDP) to respond to increasing deterioration of biological resources. A total of 193 member-states, including Australia, have signed the treaty since it was ratified in 1992 (Australian Government 2016b). The Convention has three main objectives including: protecting biological diversity, sustainable use of biological resources, and equitable use of global genetic resources. The CBD provides a framework for integrated conservation of biological and natural resources. According to the Article 6 of the Convention, Australia is responsible for advancing and implementing an effective action plan on a national scale and reporting the outcomes to the Convention (Australian Government 2016b).

The Convention is one of the Australia's key international commitments that could influence Tasmanian coastal governance processes. For example, Australia's Fifth National Report to the Convention on Biological Diversity indicates that 10 per cent of the Australian coastal areas should be conserved by 2020 (Australian Government 2014a). The strategies to achieve this commitment need to be considered in the process of coastal decision-making, policy development and planning at a state level including Tasmanian coastal area.

[5]- As indicated earlier in this chapter, while the researcher is aware of the successes and failures of the application and management of these agreements, conventions and treaties by the Australian Government, examination of implementation effectiveness is beyond the concerns of this chapter. For examples of such analyses see Prahalad and Kriwoken (2010), Crowley (2007) and Lawrence (2009).

The United Nations Framework Convention on Climate Change

Australia is one of the 192 members of United Nations Framework Convention on Climate Change (UNFCCC) since its establishment in 1994. The aim of UNFCCC and the associated Kyoto Protocol is to manage increasing greenhouse gas emissions due to human development. The Convention aims to develop responses concerning both adaptation and mitigation strategies. In this respect, the precautionary principle is adopted as the main overarching approach in the Convention (United Nations 1992).

Both UNFCCC and the Kyoto Protocol require every member-state to develop international, national and regional adaptation frameworks that consider the integration of social, economic and environmental parameters (Verschuuren & McDonald 2012). To fulfil Australia's obligations, the Australian Government is required to develop a responsive regulatory framework to reduce greenhouse gas emission and manage climate change impacts. Also, the Australian Government is responsible for providing technical and financial support to other organisations to facilitate achievement of the objectives of the Convention. In this regard, Australian Government could potentially contribute to processes of coastal decision-making when decisions at state or local levels conflict with Australia's international commitments.[6]

As the most recent activity under UNFCCC, the Paris Climate Agreement (2015) aims to enhance the effectiveness of global responses to climate change and associated risks (UNFCCC 2017). The Agreement, emphasises the responsibility of the member-states to limit global warming blow 2 degrees Celsius by reducing greenhouse gas emission (UNFCCC 2017). In this respect, the member-states are required to submit Intended Nationally Determined Contributions (INDCs) that illustrates their proposed climate actions (Rogelj et al. 2016). Under the Paris Agreement, Australia aims to reduce its greenhouse gas emission by 26-28 per cent below its 2005 emissions (Australian Governement 2017).

[6]- Albeit, Hunt (2004), Crowley (2007) and Lawrence (2009) have pointed out the Federal Government's weaknesses in developing effective climate change adaptation and mitigation strategies, and in proactive implementation of the Convention.

Convention on Wetlands of International Importance

The Convention on Wetlands of International Importance (Ramsar Convention) aims to deliver mechanisms for wise use and management of internationally significant wetland ecosystems. The Convention highlights that effective conservation of wetland ecosystems requires worldwide collaboration and relevant capacity improvement. Australia ratified the Convention in 1974.

According to the Convention, the Australian Government is committed to develop a national-level wetland conservation strategy and integrate it with other overarching policy and planning frameworks (Australian Government 2012a, 2016b). In addition, the Australian Government supports other organisations to develop and implement wetland conservation frameworks, improve public awareness and participation processes, and deliver quality knowledge and information for an informed decision-making (Australian Government 2012a, 2016b). Application of these roles in coastal wetlands could influence processes of coastal governance at other governance levels.

Convention Concerning the Protection of the World Cultural and Natural Heritage

The Convention Concerning the Protection of the World Cultural and Natural Heritage was approved by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 1972 and came into force in 1975. Australia has been a member-state since 1974. The Convention emphasises on developing mechanisms for conservation of natural and cultural heritage. These mechanisms include integrating heritage conservation strategies into national planning and policy making system (such as Australia's Biodiversity Conservation Strategy 2010-2030) and preventing human activities that could have a potential adverse impact on natural and cultural heritage through legislated developed assessment processes (see Section 4.1.2) (Australian Government 2011a).

Although Australia's World Heritage Areas are mainly managed by state governments, the Australian Government has the legal responsibility to evaluate and monitor the outcomes of management processes according to the objectives of the Convention. Thus, the Australian Government could intervene when there is a conflict between state-level decisions and Convention objectives in coastal areas. For example, under section 51(xxix) of the Australian Constitution, the Australian Government applied its power to stop the construction of

Franklin Dam in Tasmania based on Australia's international obligations under the Convention (Bandler 1987; Kellow 1989). However, as noted below, since 1992 a cooperative federalism approach has prevented the need for such interventions.

The United Nations Conference on Sustainable Development (Rio+20)

The United Nations Conference on Sustainable Development (Rio+20) held in Rio de Janeiro, Brazil on 20 to 22 June 2012 is another of Australia's international commitments that could potentially influence coastal governance arrangements. Rio+20 focussed on renewing commitments made at the 1992 Rio de Janeiro Earth Summit to sustainable development and the promotion of an economically, socially and environmentally sustainable future. The Australian Government has indicated priority areas to deliver on the sustainable development agenda such as: sustainable management of marine resources; developing disaster management plans; and advancing climate change adaptation strategies (Australian Government 2012b). However, the specific mechanisms by which these priority areas will be progressed are unclear.

Australia's commitment to Rio+20 could influence the process of coastal governance in a number of ways. For example, Rio+20 indicate a commitment to reduce disaster risk and protecting coastal and marine resources, particularly in dealing with sea level rise and coastal erosion (Australian Government 2012b). The processes to accomplish this commitment require incorporating a holistic resilience-based approach to develop disaster management plans on a national scale, and advocates a collaborative, intersectional and multi-scale attempts to improve Tasmanian coastal governance resilience capacity (Australian Government 2012b). However, to date, no specific mechanism has been developed through which this agenda has been progressed.

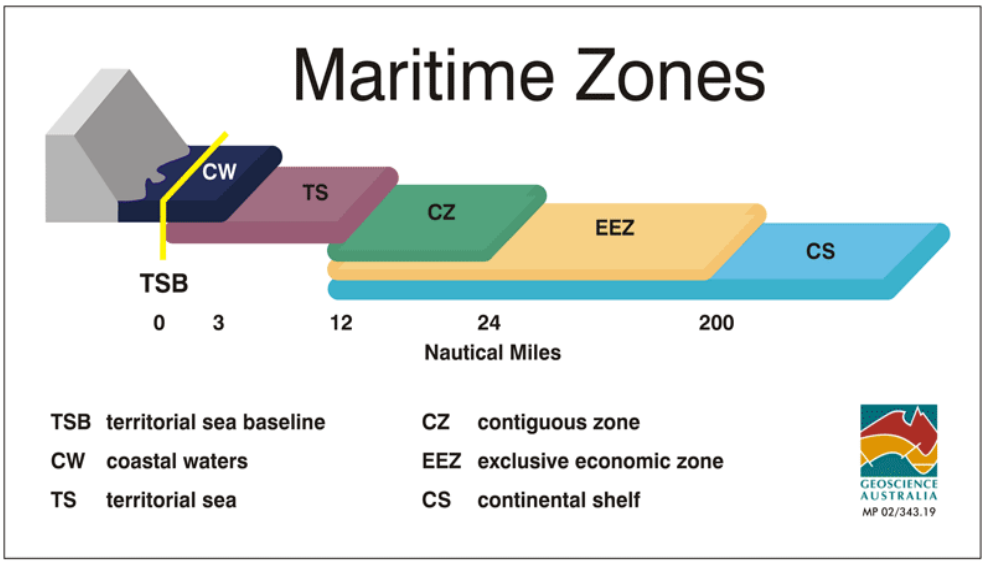
In addition, the 2030 Agenda for Sustainable Development set 17 goals to improve governance responsiveness in issues that are significant for well-being of human and natural systems (UN General Assembly 2015). Goal 14 of the agenda emphasises sustainable use and conservation of coastal and marine resources to enhance resilience and avoid irreversible impacts of human development on these areas (UN General Assembly 2015). The Australian Government is responsible for developing a national plan to ensure an effective application of the 2030 Agenda in Australia (Australain Government 2017).

United Nations Convention on the Law of the Sea

The United Nations Convention on the Law of the Sea (UNCLOS) (or Law of the Sea Convention) consists of a series of international rules and principles that aim to regulate the use of the oceans. Australia and another 164-member state ratified the Convention in 1982, which then came into force in 1994. One of the major themes is the sustainable use of the marine environment and associated resources. Figure 4.1 shows maritime zoning according to UNCLOS Convention. Australia defines its maritime jurisdiction under UNCLOS as indicated in Figure 4.2.

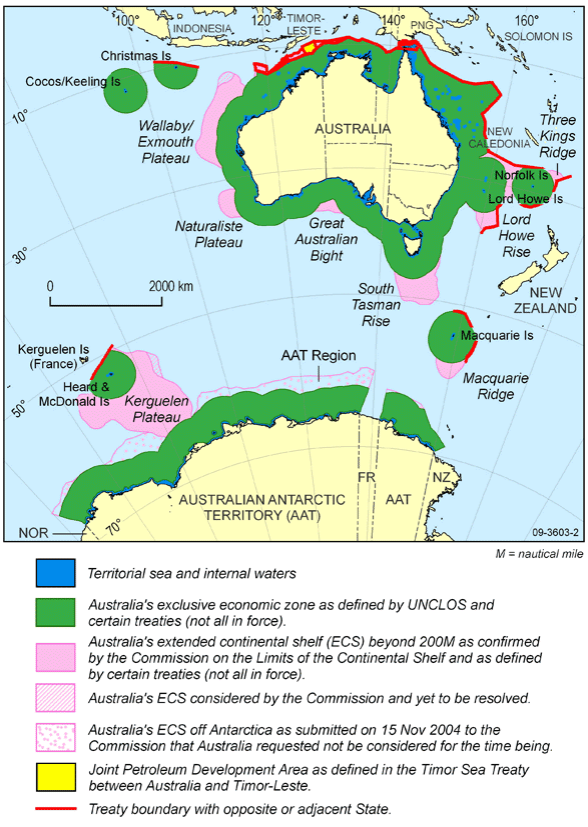
Australia governs its "territorial sea" which encompasses up to 12 nautical miles from the territorial sea baseline" (Australian Government 2017d). Further, under the Offshore Constitutional Settlement (Australian Government 1980), which clarifies the Federal Government and state government roles in regards to Australia's territorial sea, state governments have jurisdiction over waters up to three nautical miles from the baseline (Haward 1992). According to *Coastal Waters (State Powers) Act 1980,* this body of water is called coastal waters and is under the sovereignty of state governments (Australian Government 1980) (Figure 4.3).

Figure 4.1. Maritime zones defined by UNCLOS



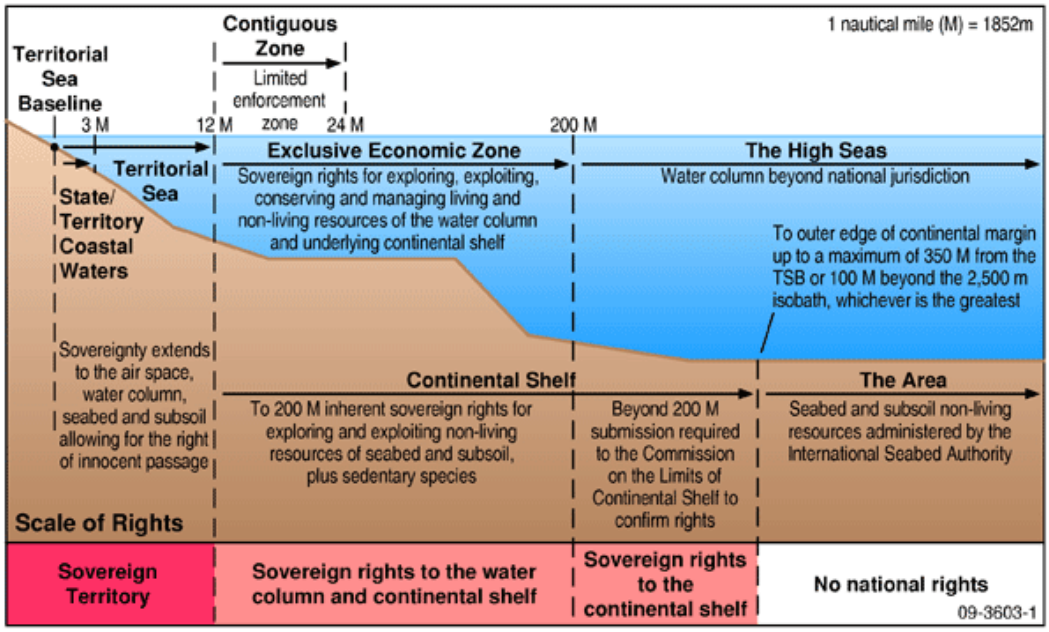
Source: Australian Government (2016d)

Figure 4.2. Various UNCLOS zones and limits that comprise Australia's marine jurisdiction



Source: Symonds et al. (2009)

Figure 4.3.Maritime zones and rights under UNCLOS



Source: Symonds et al. (2009)

Migratory Birds Agreements

To ensure the integrated conservation of the habitats of migratory birds, Australia has entered into a number of bilateral Migratory Birds Agreements including the Japan-Australia Agreement (JAMBA, 1974), China-Australia Agreement (CAMBA, 1986), and the Republic of Korea-Australia Agreement (ROKAMBA, 2007). These agreements aim to protect the migratory birds in the East Asian - Australasian Flyway and facilitate the process of partnership and knowledge sharing (Australian Government 2016b). These agreements provide appropriate context to develop partnership mechanisms for long-term conservation of Australia's migratory shorebirds (Australian Government 2016a).

4.1.2. **Influential national organisations and policies**

Five federal-level organisations that potentially influence processes of Tasmanian coastal governance are described below.

Department of the Environment and Energy (DEE)[7] is the peak Australian Government body responsible for developing and implementing environmental policy on a national scale. DEE's areas of concern encompass a variety of environmental and coastal issues including biodiversity conservation, coastal and marine planning, climate change adaptation, and environmental research and information development (Australian Government 2016b). DEE is the main federal level organisation that could influence Tasmanian coastal governance through a number of statutory (direct) and non-statutory mechanisms.

The main direct influence of DEE is through its statutory role in administering the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC). According to EPBC Act, an assessment process must be undertaken for any activity that could potentially have a substantial impact on Matters of National Environmental Significance (MNES), which are identified in Chapter 2 of the Act. The nine matters of national environmental significance protected under the EPBC Act are: world heritage properties, national heritage places, wetlands of international importance (listed under the Ramsar Convention), listed threatened species and ecological communities, migratory species protected under international agreements, Commonwealth marine areas, the Great Barrier Reef Marine Park, nuclear actions (including uranium mines), and a water resource, in relation to coal seam gas development and large coal mining development (Australian Government 2016b).

DEE also influences environmental policy and practice through its leadership role in developing national-level policies, guidelines and directions, facilitating intersectional and multi-scalar collaboration, communication and partnership, providing financial and technological support to other levels, and developing knowledge base through supporting research and implementation programs.

[7] Formerly known as the Department of Sustainability, Environment, Water, Population and Communities

For example, through developing National Climate Resilience, the Australian Government clarifies its position on climate change adaptation strategies to respond coastal problems. In addition, DEE supports climate change adaptation research through National Climate Change Adaptation Research Facility (NCCARF) (Australian Government 2016b), which creates and transfers knowledge and information relevant to coastal decision-making at state and local levels. In this regard, CoastAdapt, the online climate risk management framework, provides tools for coastal adaptation responses in dealing with climate change impacts (NCCARF 2016). However, the substantial Australian Government investment in building networks and supporting research projects has not been sustained at the initial level, with NCCARF now focussed on research communication and providing limited ongoing support for adaptation networks.

Compared with other national-level organisations, DEE has the most direct influence on Australia's coastal SES. As a result, this organisation was a focus for the detailed case study investigations in Chapters 5 and 6.

Department of Agriculture and Water Resources (DAWR) is responsible for developing and implementing a national-level legislation, policy and planning framework for sustainable agriculture, fishery and forestry (Australian Government 2015). This organisation could influence coastal governance processes through administering the *Fisheries Administration Act 1991, Fisheries Management Act 1991,* and related statutory instruments and organisations such as the Australian Fisheries Management Authority (AFMA) (AFMA 2017; Australian Government 2017a).

AFMA is a federal level statutory organisation that is responsible for sustainable management of fisheries resources within the Australia's Exclusive Economic Zone (EEZ) including offshore Tasmania (Australian Government 2017a). However, with the agreement of the Australian states, this organisation could influence the management of fisheries resources in Australian Sate's coastal waters (AFMA 2017). In this respect, AFMA could provide management plans, guidelines, directions and licencing services to state governments (AFMA 2017; Australian Government 2017a).

A secondary influence of DAWR occurs through its collaboration with other organisations to develop coastal and marine sustainability policies. For example, DAWR collaborated with DEE to develop and implement coastal and marine biodiversity conservation policies (Australian Government 2015). In this regard, DAWR participated in the process of marine bioregional planning and management of marine species (Australian Government 2015).

Department of Infrastructure and Regional Development (DIRD) is a national agency responsible for national level decision-making about infrastructure development. DIRD is responsible for delivering regional development policies and strategies, assisting local governments to enhance their management capacities, and ensuring that the local communities attain their economic and social rights (Australian Government 2017c). For example, through its Local Government Division, DIRD provides support and assistance to local governments to develop effective planning initiatives including coastal zone planning (Australian Government 2017c).

This organisation could influence coastal governance processes through a number of secondary instruments. For example, Regional Development Australia (RDA) is an initiative funded by Australia to facilitate cross-level collaboration and partnerships for regional development. In addition, the Department's National Guidelines for Infrastructure Project Delivery is a national level direction that aims to improve a consistent infrastructure planning across the government levels. In this regard, DIRD could influence the process of Tasmanian coastal planning through the application of its responsibilities and providing resources for coastal development in Tasmania.

Australian Local Government Association (ALGA) represents Australia's local governments and was established in 1947 (ALGA 2016). The main aims of ALGA include: supporting local government positions national scale decision-making, improving governance capacities, and delivering overarching advice and directions on development frameworks (ALGA 2016). In order fulfil these aims, ALGA assists local governments to: improve access to financial resources; strengthen infrastructure and technological capacity; enhance environmental and natural resource management capacity; increase the level of partnership and communication within local government level as well as across the scales (including community engagement programs) (ALGA 2016).

Issues such as climate change impacts; natural resource management; natural and human environment planning; and coastal adaptation are major concerns of the Council. For example, regarding climate change impacts, ALGA emphasises the necessity of cross-level cooperation and partnerships for developing coastal adaptation responses, availability of quality knowledge base for informed decision-making, and legal accountability of local governments to develop adaptation strategies (ALGA 2016).

Council of Australian Governments (COAG) is the peak intergovernmental organisation in Australia. COAG is an assembly of Australia's Prime Minister, state and territory First Ministers and the President of ALGA. The role of COAG is to facilitate decision-making and coordinate national-level policy development procedures. Coastal issues such as climate change impacts, sea level rise, and coastal biodiversity conservation are among the main concerns of this organisation (COAG 2016).

A key role of GOAG in influencing Tasmanian coastal governance is the responsibility to implement the Intergovernmental Agreement on the Environment (IAE). IAE is an agreement between Australian Government, state/territory governments and ALGA, made in 1992, to facilitate a collaborative national approach in dealing with environmental issues, clarifying the roles and responsibilities of governmental organisations, developing a mechanism to facilitate problem-solving across levels, improving the level of informed environmental decision-making, and enhancing environmental conservation processes (Australian Government 2017b).

The National Cooperative Approach to Integrated Coastal Zone Management (ICZM) was a Federal Government coastal management framework developed in 2006. The framework identified six implementation priority areas including: integration across the catchment-coast-ocean continuum; land and marine-based sources of pollution; climate change; pest plants and animals; planning for population change; capacity building; and monitoring and evaluation. The framework emphasised the necessity of incorporating a forward-looking and adaptive approach to achieve sustainability objectives in the coastal zone (Australian Government 2006). In addition, the framework indicated requirements for a holistic and national scale vision, appropriate evaluation and monitoring mechanisms, improving the

capacity of decision-making and planning systems, and enhancing collaboration, partnership and participation between the influential organisations (Australian Government 2006).

The framework was intended to address a lack of integration across sectors and institutions and emphasised a requirement for an integrative and proactive planning and management of Australia's coastal areas (Australian Government 2006). Studies have identified institutional fragmentation as a key issue in managing coastal and marine resources (see for example (Cicin-Sain & Belfiore 2005; Lockwood et al. 2012). The Australian Coastal Zone Inquiry similarly identified institutional fragmentation and lack of clear allocation of responsibilities as key issues for effective coastal governance (Australian Government 1993).

In practice, the application of ICZM in Australia has been limited. As the Australian Government (2016c) indicated: "Although the national ICZM framework has been formally outlined (NRMMC 2006), no body of information contains the various management policies and strategies found around Australia. Additionally, the current framework among government departments for dealing with coastal issues is largely defunct, with each state having separate management practices and legislation concerning the development of the coast".

Australia's Coastal and Ocean Policies. Prior to the 1990s, the Australian Government's efforts in oceans and coastal policy-making, planning and management were partial, fragmented and reactive (Harvey & Caton 2003). Australia was suffering from a lack of a national-scale approach to integrating the outcomes of state-level coastal management actions (Harvey & Woodroffe 2008). From 1991, the Australian Government led the development of a number of policies, strategies, guidelines, plans and programs to respond to the problems of coastal zone management (Harvey & Caton 2003; Harvey & Woodroffe 2008).

The 1991 House of Representatives Standing Committee on Environment Recreation and the Arts inquiry examined the environmental degradation of the Australian coastline and coastal waters" (Australian Government 1991). The inquiry report identified some of Australia's main coastal problems including: fragmented decision-making process, coastal and ocean pollution, and conflicts of stakeholders' value and interests. To respond to these

problems, the report proposed a national-scale coastal management strategy in collaboration with the states and local governments (Australian Government 1991).

However, such a strategy was not immediately developed, as the House of Representatives inquiry was followed by the Resource Assessment Commission (RAC) Coastal Zone Inquiry in 1993. The inquiry encompassed a variety of subjects including: the value of coastal resources, the problems and complexities of Australian coastal management processes, the institutional arrangements and approaches that influence coastal management, and the role of public participation in the process of coastal decision-making (Australian Government 1993).

The outcome of the report led to the development of the first national-level coastal policy in 1995 and subsequently the Australian Oceans Policy (AOP) in 1998 (Harvey & Caton 2003). AOP indicates the Federal Government's approach to integrative ocean governance (Harvey & Caton 2003). However, the application and implementation of these policies were poor due to their idealism, complexity and lack of resources (2009; Wang et al. 2011).

Australian Coastal Council Association

The Australian Coastal Council Association (ACCA) is a national level organisation established in 2015. The Council (formerly called National Sea Change Taskforce) aims to advocate the interests and values of coastal councils and associated local communities, and facilitate capacity building in coastal councils to respond to the issues such as climate change and sea level rise (ACCA 2017). In this regard, the Council plays a role in providing data and information, and sharing the knowledge through supporting coastal research projects and organising coastal seminars.

4.2. Tasmanian State level

Tasmanian governance arrangements for the coastal zone are complex and involve the Tasmanian State Government, regional organisations, local councils, NGOs and local communities. The major State level organisations and legislation, policy and planning frameworks will be described in this section.

4.2.1. **Institutional arrangements**

Department of Premier and Cabinet

Department of Premier and Cabinet (DPAC) is a Tasmanian Government agency with a leadership role in state-level decision-making, strategic planning and policy development. DPAC influences coastal governance through three divisions including: Climate Change Office, Policy Division and the Local Government Division. According to *State Policy and Projects Act 1993* (SPPA), the Policy Division is responsible for delivering statutory policies, such as Tasmanian State Coastal Policy, that is subjected to review by Tasmanian Planning Commission (Tasmanian Government 2016a).

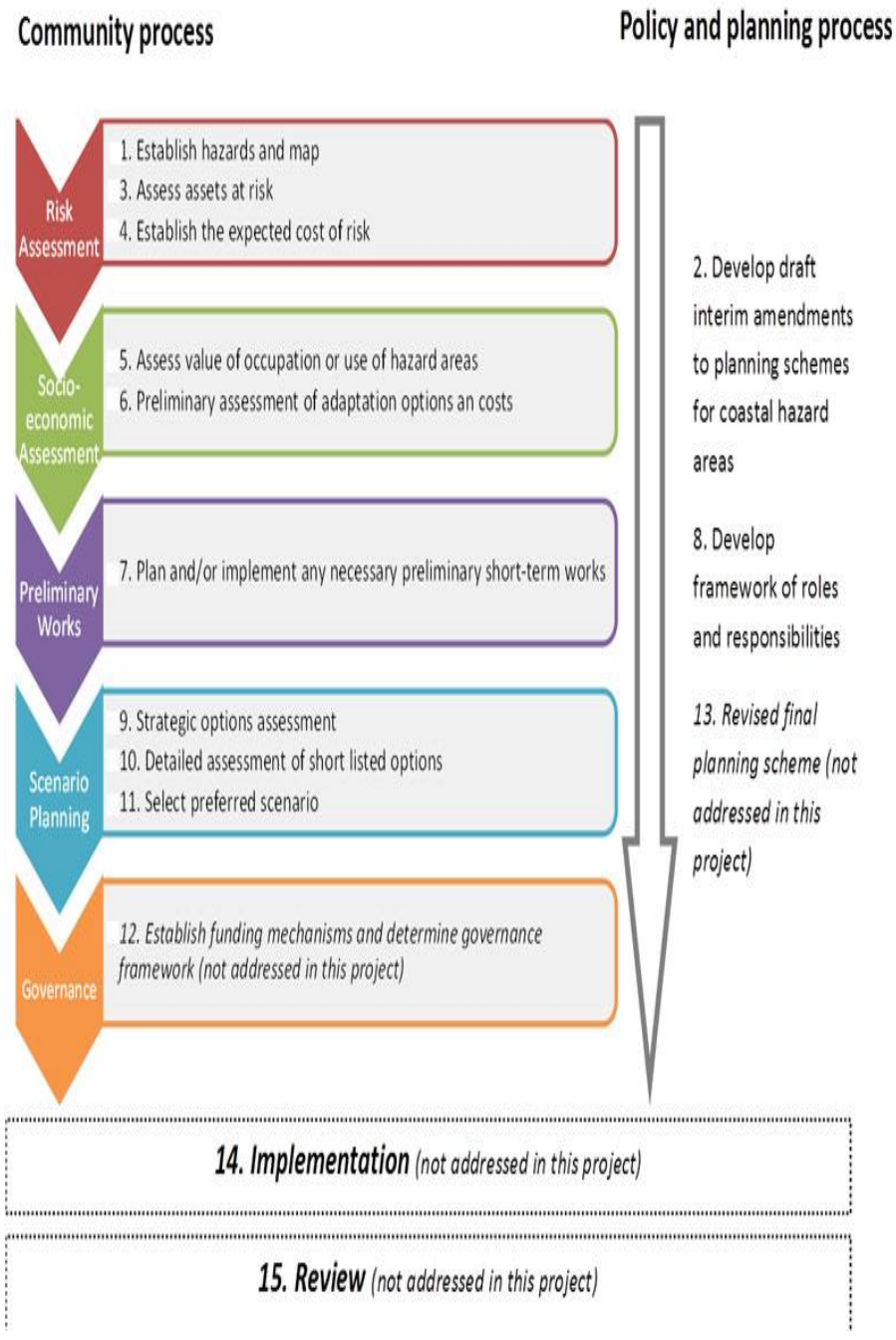
The Tasmanian Climate Change Office (TCCO) is responsible for strategic policy-making and planning concerning climate change mitigation and adaptation. The office facilitates intergovernmental partnerships and cross-scale communications, improves the capacity to deal with climate change impacts, and monitors and evaluates mitigation and adaptation measures (Tasmanian Government 2016b). TCCO plays a key role in developing policies and plans such as the Tasmanian Coastal Adaptation Pathways project (TCAP) (Tasmanian Government 2016b).

The Local Government Division is concerned with the effectiveness of collaboration and partnership between local councils and the Tasmanian State Government (Tasmanian Government 2016a). The division assists local governments to achieve sustainability objectives and enhance their public participation mechanisms. A “Good Governance Guide” was developed by this division to improve the effectiveness of local council’s governance performance (Tasmanian Government 2016a).

DPAC supported the TCAP project, which aimed to assist coastal decision-makers and coastal communities in developing climate change adaptation strategies. TCAP commenced in 2011 and subsequently progressed through three rounds of implementation. In TCAP project, vulnerable areas were first identified by councils, then coastal risks and hazards identified, analysed and mapped in each area using a risk management approach, and finally, the results were communicated with local councils and communities for advancing adaptation strategies.

TCAP project recommended a “Flexible Planning Pathway” as a useful instrument for developing climate change adaptation strategies (Figure 4.4). Based on the approaches and outcomes of TCAP, the Communities and Coastal Hazards Project (CCHP) was established in 2015. The TCCO had a leadership role in the project, which was jointly funded by Australian Government's Natural Disaster Resilience Program, LGAT, and Kingborough and Glamorgan Spring Bay Councils.

Figure 4.4. Flexible Planning Pathway



Source: DPAC (2016)

Department of Primary Industries, Parks, Water and Environment

Department of Primary Industries, Parks, Water and Environment (DPIPWE) plays a significant role in Tasmanian coastal decision-making and management. This agency is responsible for environmental sustainability, biodiversity conservation, coastal zone protection, natural resource management, environmental pollution control, and heritage conservation (Tasmanian Government 2015a). DPIPWE administers the primary environmental and natural resource legislation related to Tasmanian coastal areas. Also, this organisation delivers directions and guidelines for coastal development (Tasmanian Government 2015a).

For example, DPIPWE developed "Tasmanian Coastal Works Manual" to deliver a Best Practice Management Guide for Changing Coastlines. The manual includes specific reference to the climate change impacts and sea-level rise on coastal areas. The manual aims to enhance knowledge and awareness related to coastal management issues in order to safeguard coastal resources from potential impacts of human developments (Tasmanian Government 2010). Despite the principal responsibility in the coastal zone, DPIPWE does not have a dedicated division or office responsible for coastal planning and management.

The Tasmanian Planning Commission

The Tasmanian Planning Commission (TPC) is an independent agency and the peak statutory planning organisation in Tasmania. TPC, formerly called the Resource Planning and Development Commission (RPDC), is a statutory authority established under the *Tasmanian Planning Commission Act 1997* (renamed from the RPDC Act in 2009). The main influence of TPC on coastal governance originates from its roles in guiding the delivery of the Resource Management and Planning System (RMPS), which was introduced by the Tasmanian Government in 1993. The RMPS is a state-wide statutory system for environmental decision-making, including land use planning, pollution control and policy development.

The TPC has particular roles in relation to the *Land Use Planning and Approval Act 1993* (LUPAA), and SPPA. Currently, TPC in collaboration with other state-level agencies and local councils is reforming the State's planning system and developing a state-wide planning scheme. In this regard, in 2015 LUPAA was amended to facilitate the development of a new

planning scheme that will encompass State Planning Provisions (SPPs) and Local Provisions Schedules (LPSs) (TPC 2017).

The Tasmanian land use planning system aims to offer a consistent, yet flexible instrument for managing human development in the coastal area, considering the existing and future drivers of social and environmental changes. For example, the SPPs, which came into force in 2017, deliver a Coastal Inundation Hazard Code and a Coastal Erosion Hazard Code which assist councils in developing their LPS and hazard mapping according to the State-level coastal risks. This mechanism would enhance the level of informed decision-making regarding coastal land use development (TPC 2017).

However, according to Planning Institute Australia (PIA), the new planning system could be improved by developing more responsive actions in dealing with the impacts of climate change and sea level rise. In this regard, development and application of supportive "regulatory" instruments were suggested to improve mitigation and adaptation responses in the Tasmanian coastal area (PIA 2016).

The Tasmanian State Coastal Policy (TSCP), which was developed under the SPPA, is the main statutory policy document related to Tasmanian coastal areas. TSCP defines the government's position on sustainable development and achieving RMPS objectives in the coastal zone. The key principles of TSCP include: environmental and natural resource conservation, sustainable human development, safeguarding social value, and collaborative and participative coastal decision-making (DPAC 2016).

The development of the TSCP started in 1991 when the former Department of Environment and Planning released a discussion paper on Tasmanian coastal zone management titled as "Tasmania's coast: footprints in the sand" (Tasmanian Government 1991). The paper provided a definition for coastal areas, established a strategic framework for coastal planning and management, integrated implementation activities, and developed appropriate institutional arrangements (Tasmanian Government 1991). In 1996, the TSCP came into force as the main policy framework for the Tasmanian coastal zone.

In 1998, the State Coastal Advisory Committee (SCAC) was established to facilitate the implementation of TSCP. SCAC stated that to ensure their effectiveness and currency, state

policies must periodically be assessed and reviewed. In this respect, in 2008, the policy division of DPAC submitted a new draft of the Tasmanian coastal policy. However, in 2011, the TPC rejected the new TSCP because of its lack of strategic approach, inadequate consideration of long-term provisions, lack of emphasis on developing an appropriate information system, insufficient clarity about evaluation and monitoring procedures, and a lack of provisions to address climate change impacts and sea level rise (DPAC 2013).

Following this rejection by the TPC, the Tasmanian Government initiated a new coastal policy framework in 2012. This policy aims to adopt a more strategic approach to coastal zone planning and management as well as responding to the disadvantages of the TSCP 1996. The process is still ongoing, and a new coastal policy has not been finalised. Regardless of its weaknesses and strengths, and in the absence of a more recent and up to date coastal policy framework, the 1996 TSCP remains the main framework for Tasmanian coastal zones.

Other influential State level organisations and legislation

Other organisations and legislation that could influence processes of Tasmanian coastal governance are shown in Table 4.1 and Table 4.2 respectively. Figure 4.5 provides a schematic view of implications of the legislative framework for coastal areas. Other Tasmanian projects and programs that can potentially influence coastal governance include: Coastal Adaptation Decision Pathways program (DCCEE), Tasmanian Regional Climate Change Adaptation Project and the Tasmanian Coastal Vulnerability Project.

Table 4.1. Other influential State level organisations in Tasmanian coastal governance

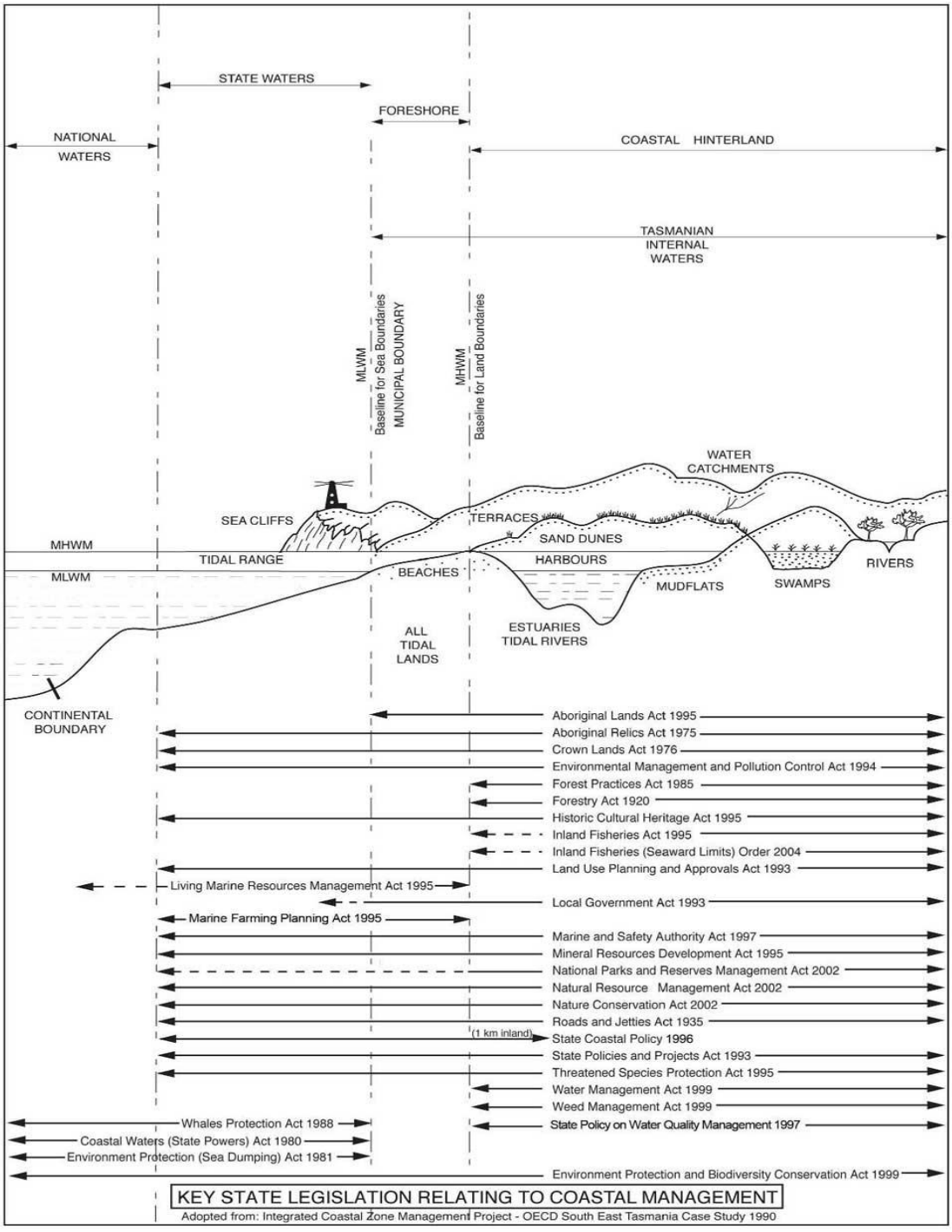
Organisation	Description of the influence
The Local Government Association of Tasmania (LGAT)	Includes local council representatives and other stakeholders and aims to improve the effectiveness of the local level governance system. LGAT provides advice and supports local councils in strategic planning and policy-making process, provides knowledge-base and facilitates learning at a local level, improves mechanisms for intergovernmental relations and communications within and across the scales, and represents local governments rights and concerns in higher level policy and legislation making (LGAT 2016).
Nationals Parks and Wildlife Service	A significant proportion of the Tasmanian coastal area is protected as national parks or reserves under the *Nature Conservation Act 2002*. Thes protected areas are managed by the Tasmanian Nationals Parks and Wildlife Service under the *National Parks and Reserves Management Act 2002*. The reserve system provides significant levels of protection for coastal biodiversity and geomorphological processes, while also allowing for recreation and tourism uses and development.
Environment Protection Authority (EPA)	The Environment Protection Authority (EPA) is the main Sate level organisation that is responsible for regulating human development impacts on ecosystems and promoting the application of sustainable environmental management. EPA administers a key element of the RMPS - the *Environmental Management and Pollution Control Act 1994* (EMPCA) and *State Policy on Water Quality Management 1997.* In this regard, EPA is responsible for environmental pollution control on coastal land and waters.
Environmental Defenders Office-Tasmania (EDO)	Is a nongovernment environmental organisation that provides legal advice for environmental protection and conservation. EDO Tasmania contributes to the development of environmental legislation framework in the State. Their goal and objectives include natural and built environment conservation, encouraging ecologically sustainable development principles; facilitating public engagement mechanisms into decision making; enhancing community knowledge about the environmental regulation and reform options, and improving environmental legislation and regulatory frameworks (EDO-TAS 2016).
Tasmanian Land Conservancy (TLC)	Is an environmental nongovernment organisation that aims to create a system of private reserves that support long-term conservation objectives (TLC 2015). TLC attempts to improve public understanding and social awareness about biodiversity values. In doing that, TLC has a close relationship with relevant governmental organisations and other organisations such as the Tasmanian Government's private land conservation program and Australia's national reserve system.
Environment Tasmania (ET)	Is the leading environmental nongovernment organisation in Tasmania and consists of 18 active member groups working in several areas including: climate change, marine protection and coastal management (Environment Tasmania 2013). This NGO is one of the major organisation that could play an important consultation role in developing a statewide coastal policy.

Table 4.2. Summary of some secondary legislation that could influence Tasmanian coastal governance

Tasmanian State Legislation	Description of the potential influence
The Living Marine Resources Management Act 1995	"Regulates fisheries activities in Tasmanian coastal area".
The Marine Farming Planning Act 1995	"Manages marine farming activities in Tasmanian coastal areas".
Nature Conservation Act 2002	"Regulate taking and trading of animals and designate national parks and reserves".
Threatened Species Protection Act 1995	"Regulate the protection and management of threatened native flora and fauna and enables and promotes the conservation of native flora and fauna".
Historic Cultural Heritage Act 1995	"Protect Tasmanian cultural and heritage areas on coastal area".
Crown Lands Act 1976	"Management, sale, and disposal of Crown lands, including the granting of leases and licences for activities on Crown Land".
Environmental Management and Pollution Control (Waste Management) Regulations 2000	"The disposal of controlled waste to prevent direct or indirect environmental harm, for recreational, commercial, domestic, agricultural or industrial processes".
Fire Service Act 1979	"All landowners/occupiers have a responsibility to maintain their properties to reduce fire hazard".
Local Government Act 1993	"Provides for the creation of council by-laws, issuing of abatement notices for environmental nuisance, and managing and owning public land".
Marine and Safety Authority Act 1997	"Establishes MAST, responsible for ensuring safe operations of vessels, provides for the development and management of marine facilities and manages environmental issues relating to vessels".
Mineral Resources Development Act 1995	"Provides for the development of mineral resources consistent with sound economic, environmental and land use management, and applies to all land and minerals in Tasmania".
Roads and Jetties Act 1935	"Relates to roads, highways and the control and management of certain jetties and marine facilities".
State Coastal Policy Validation Act 2003	"Deals with the making of Tasmanian Sustainable Development Policies, the integrated assessment of Projects of State Significance, the State of the Environment Reporting and for related purposes".
Tasmanian Ports Corporation Act 2005	"Provides for matters relating to the control of the Tasmanian Ports Corporation Pty Ltd and its assets".
Water Management Act 1999	"Provides for the control and eradication of declared weeds and the promotion of a strategic and sustainable approach to weed management".
Weed Management Act 1999	"Provides for the control and eradication of declared weeds and the promotion of a strategic and sustainable approach to weed management".
Climate Change (State Action) Amendment Bill 2014 (Also known as Climate Change (State Action) Act 2008)	"Provides legal provisions for Tasmanian Government to take account of climate change impacts and actively delivers responsive mitigation and adaptation strategies".

Source: Tasmanian Government (2010)

Figure 4.5. Key state-level legislation related to coastal governance



Source: Tasmanian Government (2010)

4.3. Tasmanian regional level

4.3.1. Regional NRM organisations

As a part of Australian Government's Natural Landcare Programme, and in order to more effectively plan and manage nation's natural resources, Australia was divided into 56 Natural Resource Management (NRM) regions (Australian Government 2014b). Each region is administered by an NRM organisation. NRMs are intermediate planning level that aims to deliver a consistent decision-making and planning framework and enhance cross-level organisational communication and partnerships (Australian Government 2014b). Regional NRM organisations collaborate with the regional communities to identify local priorities for future development (Australian Government 2014b).

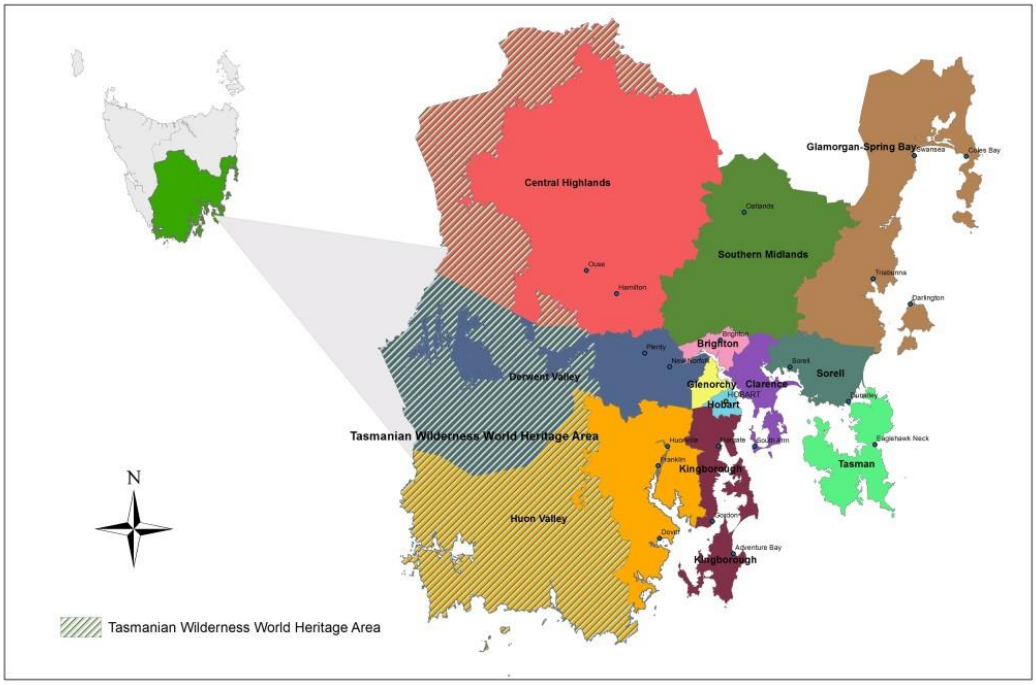
Tasmanian regional planning consists of three NRM regions: North West, North East and Southern regions (Figure 4.6). Each region is managed by an NRM organisation, respectively NRM North, Cradle Coast NRM and NRM South. Each NRM organisation contributes to natural resource management of that particular region (NRM South 2016; Tasmanian Government 2015b).

NRM South is responsible for sustainable management of natural resources, environmental conservation of southern region in Tasmania (Figure 4.7) (NRM South 2016). This region covers 2.5 million hectares of the State including four Ramsar wetlands, 27 national significant wetlands, nine estuaries with high conservation values, three marine bioregions (Bruny, Davey and Freycinet, including marine protected areas), three major river and estuarine systems, the Derwent, Huon and Gordon rivers and parts of the north-flowing Macquarie and Esk Rivers, a number of important migratory animal sites and a number of aboriginals and historic heritage sites (NRM South 2016). The council areas located in the Southern region include: Brighton, Central Highlands, Clarence City, Derwent Valley, Glamorgan Spring Bay, Glenorchy City, Hobart City, Huon Valley, Kingborough, Sorell, Southern Midlands and Tasman (NRM South 2016).

Figure 4.6.Tasmanian NRM regions

Source: Tasmanian Government (2015b)

Figure 4.7. NRM South Region, with subregions given in various colours



Source: NRM South (2016)

4.3.2. **Southern Tasmanian Councils Authority**

The Southern Tasmanian Councils Authority (TSCA) is a regional partnership between 12 Southern Councils including Brighton, Central Highlands, Clarence City, Derwent Valley, Glamorgan Spring Bay, Glenorchy City, Hobart City, Huon Valley, Kingborough, Sorell, and Southern Midlands Councils. In collaboration with the Tasmanian Climate Change Office and LGAT, the TSCA developed the Regional Councils Climate Adaptation Project (RCCAP). The purpose of this pilot project was to enhance local councils' resilience capacity for dealing with climate change impacts. The project examined the potential risks of climate change on local SES and provided Climate Change Adaptation Plan for 12 southern councils (STCA 2012). Other outcomes of the project included Community Based Land Use Plans for the themes of: coastal, urban, peri-urban, rural and natural areas; a Regional Climate Adaptation Strategy; and a Climate Adaptation Toolkit for reviewing Councils' Adaptation Plans (STCA 2012).

4.3.3. **Regional planning under LUPAA**

Reforms to LUPAA in 2015 led to the development of a regional planning framework for Tasmania that was additional to local government level planning. Regional land use plans were developed by the Cradle Coast Authority in the north-west, Northern Tasmania Development in the north and northeast, and Southern Tasmanian Councils Authority in the south (Tasmanian Government 2015a). These strategic plans were designed to be consistent with the State-level regulatory framework and consider environmental capabilities of each region. In addition, the strategic plans are intended to deliver a consistent framework for local level planning. Three strategic regional plans have been declared: Living on the Coast - The Cradle Coast Regional Land Use Planning Framework for the North-west region, Regional Land Use Strategy of Northern Tasmania for the Northern region and the Southern Tasmania Regional Land Use Strategy 2010-2035 for southern region (NRM South 2016; Tasmanian Government 2015b; TPC 2016).

For example, Southern Tasmania Regional Land Use Strategy 2010-2035 indicates the deterioration of coastal resources in Tasmania's southern region due to conflicting interests and values. The strategy emphasises the development of an effective regional scale land use planning system that considers the impacts of human development, as well as existing and future drivers of environmental and social changes (including climate change). In this regard,

the strategy draws out four strategic directions and two regional policies for successful management of the coastal systems. These regional policies include: maintain, protect and enhance the biodiversity, landscape, scenic and cultural values of the region's coast, and ensure use and development in coastal areas are responsive to effects of climate change including sea level rise, coastal inundation and shoreline recession (STCA 2016).

The Derwent Estuary Program (DEP), established in 1999, is a multi-lateral regional program to protect and enhance environmental conditions of the estuary of the River Derwent. The program focuses on reducing water pollution, habitat conservation, monitoring and evaluation of river health, and manage related land uses. The main program participants include: Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough councils, the Tasmanian State Government, TasWater, Tasmanian Ports Corporation, Norske Skog Boyer, Hydro Tasmania and Nyrstar Hobart (DEP 2009). In 2011, the program researched to identify the impacts of climate change and sea level rise on the Derwent estuary's coastal systems and the potential planning responses cross-scales. The research identified the key climate change-related threats, and the mapped the sensitive areas. The study suggested an integrative local government planning instrument is required for the long-term sustainability of the ecosystems (DEP 2011).

Finally, there are indications in the literature that what is happening in the current coastal governance, in an Australian context, and respectively in Tasmania, is devolution of roles and responsibilities, from higher levels of governance to regional and local organisations such as NRM and local councils. For example, scholars argue that NRM organisations are left dealing with the highly complex and interrelated issues without appropriate support (i.e. financial and human resources) from Federal and state governments (Curtis et al. 2014; Lockwood & Harwood 2017). The evidence for inappropriate devolution and lack of support from Federal and State Governments will be discussed in more detail in Chapters 6 and 7.

4.4. Local Governments

In Australian governance arrangements, local governments (or councils) are creations of state governments and their roles and responsibilities are regulated under the state laws and regulations. In Tasmania under the *Local Government Act 1993*, the main role of local governments includes providing an effective local level governance system to support, the

health, welfare and interests of local communities and municipal area. Tasmania has 29 Local Government Areas (LGA) including 20 councils with a coastal zone (Figure 4.8).

Figure 4.8. Tasmanian local government areas

Source: LGAT (2016)

Each council consist of a number of elected members (between 7-12) as well as non-elected members (or staff). The elected members include a mayor, deputy mayor and councillors (Tasmanian Government 2016a). Council's staffs encompass a broad range of non-professional and professional expertise including managers, planners and engineers. A general manager is responsible for developing policies, plans and programs for achieving council's objectives, implementation, and evaluation and monitoring (LGAT 2016).

The variety of expertise in each council area depends on factors such as issues of concern and priorities, the size and population of the related local government area, and access to financial resources. For example, while larger local councils such as Clarence and Kingborough have environmental or climate change officers in their organisations, some smaller councils, such as Huon Valley, do not have this expertise amongst their staff.

Local governments are the main operational level organisations for coastal management issues. The State Government has delegated the implementation of LUPAA to local councils. According to LUPAA, local governments are the responsible for land use planning and assessment of development proposals within their jurisdictions. In addition, councils collaborate in the process of national and state decision-making and planning in their jurisdiction.

In the reformed Tasmanian planning system, the new planning schemes guide local level land use developments and address coastal issues such as erosion and inundation. As indicated in Section4.2, in the reformed Tasmanian planning system local councils develop Local Provisions Schedules according to State Planning Provisions which include Coastal Inundation Hazard Code and a Coastal Erosion Hazard Code (NCCARF 2017). This enhances the level of evidence-based and informed decision-making in dealing with coastal risks and hazards at a local level.

In addition, councils, as the main asset and infrastructure holders in their jurisdiction, play an important role in managing impacts of climate change at a local level (Tasmanian Government 2016a). Councils develop and implement coastal plans and programs with support and collaboration with other governance levels such as the Federal Government, State Government, regional institutions, other councils and local communities. For example, Clarence City Council completed a project on Climate Change Impacts on Clarence Coastal

Areas, which was sponsored by the State Emergency Service and the Commonwealth Department of Climate Change. The project aimed to deliver an "integrated assessment of climate change risks on coastal areas" (Clarence City Council 2009). In this regard, the project assessed the risks of climate change impacts on the Council's coastal area, identified organisational roles and responsibilities (Including the local communities) in developing potential responses, and proposed a framework to develop adaptation strategies to respond to the problems.

To provide an overall understanding of Tasmanian coastal governance on a local scale, the following three councils were identified for further investigations: Clarence, Kingborough and Huon Valley. A number of criteria were involved in the selection process including the council's organisational structure relevant to environmental and coastal issues, quantity and quality of past and ongoing coastal plans and programs, geographic location of the council, the degree of coastal problems in that jurisdiction, and availability and accessibility of the coastal experts in the councils.

As mentioned in Section 2.5.5, this research does not aim to assess coastal management capacity at each particular council. Nor does it aim to compare the three councils' performance regarding the effectiveness of their coastal management activities. The three councils were selected to represent the general local government's roles, responsibilities, and the mechanisms of their influence on Tasmanian coastal governance.

Clarence Council claims that it was the first local government in the State that evaluated the impacts of future changes in the coastal areas. In this regard, the Council developed two projects including: coastal processes, coastal hazards, climate change and adaptive responses for the preparation of a coastal management strategy for Clarence City (2008); and Climate Change Impacts on Clarence Coastal Areas (2009). In the second project future, coastal climate change hazards and associated cross-level organisational roles and responsibilities were identified. The severity of risk in different council's coastal area was then indicated, and a responsive adaptation framework was developed (Clarence City Council 2009). The outcome of this project has provided the knowledge and information for an evidenced-based and informed decision-making and planning on the Councils coastal areas (Clarence City Council 2009).

Kingborough Council has shown a significant concern regarding the Council's coastal area, associated challenges, and potential responses. The Council developed or participated in a number of projects and reports including: Tasmanian Coastal Adaptation Pathways Project Kingston Beach (2012); Kingborough Council Shoreline Monitoring Program (2014); Coastal Hazard Assessment for Kingborough Local Area (2014); Information Priorities for Resolving Priority Coastal Hazard Adaptation Responses in Kingborough Local Government Area (2016); Kingston Beach Integrated Climate Change and Natural Hazards Project (2016); and Coastal Hazards Options Study (2017). The Kingston Beach Integrated Climate Change and Natural Hazards Project, for example, identified the climate change impacts and hazards on Kingston Beach including coastal flooding and inundation that cause infrastructure degradation and public health issues (Climate Planning 2016). In addition, the report identified barriers to adaptation planning in the area and provided recommendations to respond to them (Climate Planning 2016).

4.5. Chapter Summary

Tasmanian coastal governance is a multi-level with roles and responsibilities are shared amongst multiple organisations and instruments. Key influential organisations and the levels and mechanisms of their influence on Tasmanian coastal governance were identified, with particular emphasis on the Australian Government, Tasmanian State Government, regional NRM bodies, local councils and NGOs.

The Australian Government is responsible for international and national scale decision-making and policy development, with the most influential department being DEE. The main statutory instrument that Australian Government could use to influence processes of Tasmanian coastal governance is EPBC Act. Other mechanisms include the Australian Government's leadership role in developing national level policies and strategies as well as delivering technical and financial support to other tiers.

The Tasmanian State Government influences coastal governance within the state jurisdiction, particularly through its agencies DPIPWE, DPAC and TPC. LUPAA, EMPCA, and SPPA are the main statutory mechanisms at this level. The State Government also influences coastal outcomes through its role in developing state-level policies, guidelines, plans and programs.

At the regional level, NRM organisations have a degree of influence on natural resource management and environmental conservation in the coastal zone. The three Tasmanian regional NRM bodies have each developed regional strategic plan that includes consideration of coastal areas. Finally, at the local level, councils are responsible for local land use planning under LUPAA and for addressing coastal management issues through their role in developing and implementing local level plans and programs.

Chapter 5. **Survey analysis**

This chapter analyses the survey data and presents findings on Tasmanian coastal governance resilience capacity. A brief introduction to the survey structure is provided, followed by an evaluation of the importance of the 16 attributes in developing resilience-based Tasmanian coastal governance. Next, an organisational scale analysis is presented that assesses the performance of the selected organisations with regard to each attribute. A set of criteria that explain modes of resilience (or degree of resilience capacity) is established. Finally, the regime is compared against the criteria, and the results will be discussed.

5.1. Evaluation of Tasmanian coastal governance attributes

One of the aims of the survey was to obtain the opinions of experts on the significance of the selected attributes in developing a resilience-based Tasmanian coastal governance, or enhancing its resilience capacity. Participants were asked to indicate their opinion on the importance of each attribute on every governance unit (or governance layer).[8] Survey results were then imported into Microsoft Excel. The qualitative assessment ratings from the online questionnaire were translated to numeric values ranging from Not Important=0 to Very Important =5. The mean and standard deviation (St. Dev.) were calculated for each unit. A set of criteria was established to define the importance group (Table 5.1). The "importance value" is a number equal to attributes "mean value" (which will be called value from now on), ranging from 0 to 5. The "importance group" is a qualitative classification of the importance of an attribute, ranging from "Not Important" to "Very Important". Finally, results were examined against the criteria, and the findings presented.

The findings showed that the importance value (mean value) varied from one governance level to another. The analysis suggested that the degree of importance of each attribute depends on a number of factors including the influence of the governance level on coastal decision-making and policy development, roles and responsibilities at various levels, and the

[8] Governance unit is different to governance level. In this research, a governance unit is a unit of analysis in Tasmanian coastal governance arrangement that shows intersectional and cross-level interactions between one level of governance (or organisation) with others, either in the same or different levels. For example, the interactions between one local council with other local council (Local government-Local government) is a governance unit. In total, 83 units were identified in Tasmanian coastal governance arrangements.

condition of the interactions between a focal level with others. For example, because the State Government is the main responsible level for developing coastal legislative frameworks, supportive legislation acquired a higher importance value at this level compared to others (Table 5.1).

For some attributes, variation in importance value (across levels) was greater than for others, which caused an alteration in the attribute importance group across various levels. For instance, at the Tasmanian Government-Local Governments unit, organisational cooperation and coordination acquired a high value (mean=3.7) which placed the attribute in the Very Important group. However, for NRM-Business sector the same attribute was in one lower group (Important group). The range of variation for organisational learning was less varied (3.8 ≥ mean≥ 3.7) with the attribute as Very Important in all governance units.

Table 5.1. Importance values of the attributes for different governance level/units

Attributes	Governance unit	Mean	St. Dev
Adaptive planning and management cycle	AG	3.4	0.88
	TG	3.7	0.54
	Regional NRM	3.3	0.90
	LG	3.7	0.56
Conflict resolution mechanisms	AG	3.2	0.87
	TG	3.4	0.79
	Regional NRM	3.0	1.04
	LG	3.6	0.66
Distribution of power	AG - TG	3.0	0.98
	AG - NRM	2.3	1.21
	TG - NRM	2.5	1.25
	TG - LG	3.4	0.83
	NRM - LG	2.6	1.26
Diversity of expertise	AG	3.4	0.79
	TG	3.8	0.48
	Regional NRM	3.5	0.77
	LG	3.5	0.88
Knowledge acquisition mechanism	AG	3.3	0.91
	TG	3.8	0.52
	Regional NRM	3.2	0.94
	LG	3.5	0.78
Knowledge management processes	AG	3.5	0.75
	TG	3.8	0.59

Attributes	Governance unit	Mean	St. Dev
	Regional NRM	3.2	0.88
	LG	3.3	0.92
Knowledge sharing mechanisms	AG	3.3	1.04
	TG	3.7	0.71
	Regional NRM	3.5	0.73
	LG	3.5	0.80
Leadership for change	AG	3.6	0.69
	TG	3.8	0.43
	Regional NRM	3.3	0.87
	LG	3.5	0.79
Leadership for securing outcomes	AG	3.5	0.93
	TG	3.7	0.62
	Regional NRM	3.4	0.88
	LG	3.5	0.93
Organisational cooperation and coordination	AG - TG	3.5	0.69
	TG - LG	3.7	0.52
	LG - LG	3.4	0.75
	NRM - LG	3.3	0.84
	LG - Community Groups	3.3	0.83
	TG - NRM	3.3	0.92
	NRM - Community Groups	3.2	0.89
	TG - Business Sector	3.0	0.98
	TG - Community Groups	3.0	0.96
	AG- Regional NRM	3.0	1.00
	NRM - NGOs	3.0	1.02
	TG - NGOs	2.9	0.97
	Community Groups - Community Groups	2.9	1.00
	LG - Business Sector	2.9	1.00
	LG - NGOs	2.8	0.99
	NRM - Business Sector	2.7	1.07
Organisational flexibility	AG	3.2	0.91
	TG	3.5	0.76
	Regional NRM	3.2	1.02
	LG	3.5	0.65
Organisational learning	AG	3.7	0.60
	TG	3.8	0.45
	Regional NRM	3.7	0.62
	LG	3.8	0.43
Organisational partnerships	AG-TG	3.3	0.87
	TG - LGs	3.6	0.65

Attributes	Governance unit	Mean	St. Dev
	Regional NRM - LGs	3.3	0.81
	LGs - LGs	3.3	0.82
	TG - Regional NRM	3.3	0.93
	AG- Regional NRM	3.1	0.99
	Regional NRM - NGOs	3.0	1.00
	TG - NGOs	3.0	1.02
	LG - Business Sector	3.0	1.04
	Local Governments - NGOs	3.0	1.01
	TG - Business Sector	2.9	1.00
	Regional NRM - Business Sector	2.7	1.09
Stakeholder engagement processes	AG	3.1	1.03
	TG	3.6	0.58
	Regional NRM	3.4	0.76
	LG	3.6	0.67
Supportive legislation	AG	3.4	0.94
	TG	3.9	0.33
Transparent decision-making processes	AG	3.4	0.87
	TG	3.7	0.57
	Regional NRM	3.1	1.08
	LG	3.7	0.61
AG = Australian Government TG = Tasmanian Government LG = Local Government(s)			

The results revealed that all the selected attributes have some importance for developing resilience-based Tasmanian coastal governance or enhancing resilience capacity. The degree of contribution varied between a minimum of Moderately Important to Very Important. Only two units were confined to the Moderately Important group: distribution of power between TG-NRM and AG-NRM (Table 5.2). The rest of the attributes were in Important or Very Important groups for all the units.

Table 5.2. Distribution of governance units by importance

Importance group	Number of units in the importance group	Percentage of units in the importance group
Not important (Mean ≤0.5)	0	(0%)
Somewhat important (0.5 <Mean ≤1.5)	0	(0%)
Moderately important (1.5 <Mean ≤2.5)	2	(2.5%)
Important (2.5 <Mean ≤ 3.5)	60	(72%)
Very Important (3.5 <Mean)	21	(25.5 %)

Moreover, to identify the influential levels of governance, it was assumed more high-value attributes at each level (or organisation) indicate a higher influence on Tasmanian coastal governance. Table 5.3 shows the distribution of the attributes importance at each level. With 11 Very Important and two Important attributes, the Tasmanian State Government was the most influential tier. With five Very Important attributes, local councils had the next level of influence. Nevertheless, the Australian Government and regional NRM bodies had a lower influence compared with other organisations.

Regarding individual attributes, organisational learning was Very Important for all the governance units. So, organisational learning could be considered as one of the most significant attributes in enhancing resilience capacity. On the other hand, organisational flexibility was not Very Important at any level. Also, the findings revealed that leadership for change was more important at the AG and TG levels rather than regional and local. Thus, in the process of developing resilience-based coastal governance, improving leadership for change at upper-level organisations is more influential and of a higher priority. This finding will be further developed in Chapter 7.

Table 5.3. Attribute importance at each governance level/unit

Governance Level	Very Important	Important	Moderately Important
AG	organisational learning, leadership for change	knowledge management processes, leadership for securing outcomes, transparent decision-making processes, supportive legislation, diversity of expertise, adaptive planning and management cycle, knowledge acquisition and sharing mechanisms, conflict resolution mechanisms, organisational flexibility, stakeholder engagement processes	
TG	the supportive legislation, leadership for change, organisational learning, diversity of expertise, knowledge acquisition, management and sharing processes, transparent decision-making processes, leadership for securing outcomes, adaptive planning and management cycle, stakeholder engagement processes	organisational flexibility, conflict resolution mechanisms	
LG	organisational learning, adaptive planning and management cycle, transparent decision-making processes, stakeholder engagement processes, conflict resolution mechanisms	knowledge acquisition, management and sharing mechanism, leadership for change and securing outcomes, organisational flexibility, diversity of expertise	
Regional NRM	organisational learning	knowledge acquisition, management and sharing mechanisms, diversity of expertise, stakeholder engagement processes, leadership for change and securing outcomes, adaptive planning and management cycle, organisational flexibility, transparent decision-making processes, conflict resolution mechanisms	
Inter-organisational relationships	organisational cooperation and coordination TG-LG	organisational cooperation and coordination between all governance level (excluding TG-LG), Distribution of power between all governance level except AG-NRM and TG-NRM, organisational partnership between all levels	distribution of power AG-NRM and TG-NRM

5.2. Performance evaluation

Another purpose of the online survey was to evaluate the regime of attributes performance at different organisations. The assessment was designed to show the weaknesses and strengths of current coastal governance and inform the process of developing a resilience-based arrangement in Tasmania. In this respect, participants were asked to rate organisational performance with regard to each attribute (ranging from Very Poor to Desirable). Attributes were converted to an importance scale with numeric values ranging from Very Poor=0 to Desirable=5. The results were exported to Microsoft Excel, and the mean, mode and standard deviation were calculated. A set of relevant performance assessment criteria was established, and the mean values were examined against the criteria. The organisational performance was grouped, and the findings are presented in Table 5.4.

Table 5.4. Performance against the attributes for each governance unit

Organisation	Attribute	Mean	Mode	St. Dev	Level average
Australian Government	Knowledge sharing mechanisms	2.1	2	0.98	1.7
	Knowledge management processes	2.1	3	1.05	
	Diversity of expertise	2.1	2	1.15	
	Knowledge acquisition mechanism	1.9	2	0.97	
	Transparent decision-making processes	1.8	2	0.99	
	Adaptive planning / management cycle	1.6	2	1.04	
	Organisational learning	1.6	2	0.97	
	Conflict resolution mechanisms	1.6	2	0.93	
	Stakeholder engagement processes	1.6	2	0.99	
	Organisational flexibility	1.5	2	0.86	
	Supportive legislation	1.5	2	1.00	
	Leadership for change	1.5	1	0.95	
	Leadership for securing outcomes	1.4	2	0.94	
DPAC	Knowledge sharing mechanisms	2.0	3	1.11	1.7
	Knowledge management processes	2.0	3	1.14	
	Knowledge acquisition mechanism	1.9	1	1.13	
	Diversity of expertise	1.9	1	1.16	
	Transparent decision-making processes	1.8	2	0.97	
	Organisational flexibility	1.7	2	1.01	
	Stakeholder engagement processes	1.7	2	1.14	
	Conflict resolution mechanisms	1.7	1	1.04	
	Organisational learning	1.7	2	0.95	
	Leadership for change	1.7	1	1.09	
	Leadership for securing outcomes	1.6	1	1.01	
	Adaptive planning / management cycle	1.5	1	1.08	
	Supportive legislation	1.3	1	0.98	

Organisation	Attribute	Mean	Mode	St. Dev	Level average
DPIPWE	Knowledge management processes	2.4	3	1.02	2
	Knowledge sharing mechanisms	2.4	2	0.97	
	Diversity of expertise	2.4	2	1.11	
	Knowledge acquisition mechanism	2.2	3	0.98	
	Organisational learning	2.0	2	0.94	
	Stakeholder engagement processes	1.9	2	0.98	
	Transparent decision-making processes	1.9	2	0.97	
	Organisational flexibility	1.9	2	1.00	
	Adaptive planning / management cycle	1.8	2	1.07	
	Leadership for securing outcomes	1.8	2	0.88	
	Conflict resolution mechanisms	1.8	2	0.95	
	Leadership for change	1.7	1	0.96	
	Supportive legislation	1.3	1	0.98	
TPC	Transparent decision-making processes	2.1	2	1.16	1.7
	Conflict resolution mechanisms	2.0	2	1.21	
	Diversity of expertise	2.0	2	1.16	
	Knowledge management processes	1.9	1	1.08	
	Knowledge acquisition mechanism	1.9	1	1.06	
	Knowledge sharing mechanisms	1.9	2	0.97	
	Organisational learning	1.8	2	1.06	
	Stakeholder engagement processes	1.7	2	1.04	
	Organisational flexibility	1.5	2	0.83	
	Adaptive planning / management cycle	1.5	2	1.11	
	Leadership for change	1.5	1	1.02	
	Leadership for securing outcomes	1.4	2	0.98	
	Supportive legislation	1.3	1	0.98	
Clarence Council	Leadership for change	3.1	4	1.01	2.8
	Knowledge acquisition mechanism	2.9	3	1.04	
	Transparent decision-making processes	2.8	3	0.95	
	Leadership for securing outcomes	2.8	3	1.02	
	Stakeholder engagement processes	2.8	3	0.98	
	Organisational learning	2.8	2	0.89	
	Knowledge management processes	2.8	3	0.85	
	Knowledge sharing mechanisms	2.8	2	0.86	
	Diversity of expertise	2.7	3	0.97	
	Adaptive planning / management cycle	2.5	2	1.14	
	Conflict resolution mechanisms	2.5	2	1.12	
	Organisational flexibility	2.5	2	1.00	
Huon Valley Council	Organisational learning	1.9	2	0.82	1.7
	Knowledge acquisition mechanism	1.8	2	0.88	
	Stakeholder engagement processes	1.8	2	0.89	
	Leadership for securing outcomes	1.8	2	1.04	
	Transparent decision-making processes	1.8	2	1.01	
	Conflict resolution mechanisms	1.8	2	1.05	
	Knowledge management processes	1.7	2	0.89	
	Knowledge sharing mechanisms	1.7	1	0.82	
	Diversity of expertise	1.6	2	1.11	
	Leadership for change	1.6	1	0.99	
	Organisational flexibility	1.6	1	0.87	

Organisation	Attribute	Mean	Mode	St. Dev	Level average
	Adaptive planning / management cycle	1.5	2	0.87	
Kingborough Council	Leadership for change	2.9	3	0.81	2.7
	Knowledge acquisition mechanism	2.9	3	0.78	
	Knowledge management processes	2.8	3	0.84	
	Leadership for securing outcomes	2.7	3	0.88	
	Organisational learning	2.7	3	0.85	
	Transparent decision-making processes	2.7	3	0.78	
	Diversity of expertise	2.7	3	0.91	
	Knowledge sharing mechanisms	2.6	3	0.88	
	Stakeholder engagement processes	2.6	3	0.80	
	Organisational flexibility	2.5	3	0.92	
	Adaptive planning / management cycle	2.5	2	1.12	
	Conflict resolution mechanisms	2.4	2	1.09	
NRM South	Knowledge sharing mechanisms	2.7	3	1.02	2.6
	Stakeholder engagement processes	2.7	3	0.98	
	Diversity of expertise	2.7	3	0.95	
	Leadership for change	2.7	3	0.92	
	Leadership for securing outcomes	2.6	2	1.08	
	Transparent decision-making processes	2.6	3	1.06	
	Organisational learning	2.6	3	1.02	
	Organisational flexibility	2.6	3	1.06	
	Knowledge acquisition mechanism	2.6	2	1.01	
	Knowledge management processes	2.5	2	0.93	
	Adaptive planning / management cycle	2.4	3	1.02	
	Conflict resolution mechanisms	2.3	2	0.98	
Distribution of power	TG - LG	1.7	2	0.96	2
	AG - TG	3	4	0.98	
	NRM - LG	2.1	2	0.97	
	TG - NRM	1.8	2	0.96	
	AG - NRM	1.8	2	0.83	
Organisational cooperation and coordination	TG - LG	1.9	2	0.83	1.9
	AG - TG	1.7	2	0.96	
	LG - LG	2.1	2	0.82	
	NRM - LG	2.4	3	0.76	
	LG - Community Groups	2.3	2	0.81	
	TG - NRM	2.1	2	0.86	
	NRM - Community Groups	2.5	2	0.86	
	TG - Business Sector	1.8	2	0.81	
	TG - Community Groups	1.4	1	0.80	
	AG- Regional NRM	2	2	0.81	
	NRM - NGOs	2.2	2	0.87	
	TG - NGOs	1.4	1	0.87	
	LG - Business Sector	1.7	2	0.75	
	LG - NGOs	1.7	2	0.74	
	NRM - Business Sector	1.8	2	0.78	

Organisation	Attribute	Mean	Mode	St. Dev	Level average
Organisational partnerships	Regional NRM - LGs	2.5	3	0.90	1.9
	Regional NRM - NGOs	2.5	2	0.97	
	LGs - LGs	2.2	2	1.13	
	TG - Regional NRM	2.1	2	0.86	
	AG- Regional NRM	2.1	2	0.79	
	Regional NRM - Business Sector	1.9	2	0.87	
	LG - NGOs	1.8	2	0.78	
	TG - LGs	1.8	2	0.89	
	AG-TG	1.7	2	0.96	
	LG - Business Sector	1.7	1	0.84	
	TG - Business Sector	1.6	2	0.87	
	TG - NGOs	1.4	1	0.85	
Very Poor or Poor	**(Mean ≤ 1.5)**				
Marginal	**(1.5 < Mean ≤ 2)**				
Average	**(2 < Mean ≤ 2.5)**				
Satisfactory	**(2.5 < Mean ≤ 3)**				
Desirable	**(3 < Mean)**				

Generally, NRM South, Clarence and Kingborough Councils had a higher performance compared with other organisations (Table 5.4). In these three organisations, no attribute was found to be marginal or poor performing. However, these organisations need to improve their performance capacity for the marginal attributes including adaptive planning and management cycle and conflict resolution mechanisms.

At an Australian Government level (Department of the Environment),[9] the results showed that no attribute was in the satisfactory or desirable performance group. Attributes related to knowledge system (knowledge acquisition, management and sharing mechanisms) and diversity of expertise were better performing compared with others. For the Department of the Environment, the following performed poorly: organisational flexibility, supportive legislation, leadership for change and leadership for securing outcome.

At the Tasmanian State level, all the three agencies were assessed to have a marginal performance. DPIPWE had a slightly better position than the others. Supportive legislation, as a Very Important attribute at this level, was in a poor performing condition. TPC had five attributes in the poor category and was assessed in the lowest performing group.

[9] The name of this agency changed to Department of Environment and Energy In 2016.

Organisational flexibility, adaptive planning and management cycle, leadership for change and leadership for securing outcomes were the poorly performed attributes for TPC.

Although the overall performance on a local scale was marginal, the performance regime for each particular council was different. Amongst the three councils, Clarence and Kingborough Councils had a significantly higher performance position than Huon Valley Council. The performance of Clarence and Kingborough Councils were in a satisfactory condition (mean = 2.8 and 2.7, respectively), whereas Huon Valley Council's performance was marginal (mean=1.7).

The only attribute in a desirable performance condition in the entire coastal governance arrangement was leadership for change at Clarence Council. Generally, 21 per cent of the units were rated satisfactory, and 23 per cent showed an average level of performance (Table 5.5). A significant percentage of the attributes were in a marginal condition (almost 45%). Finally, 11 per cent of the attributes were reported as poorly implemented in the entire Tasmanian coastal governance.

Table 5.5. Overall performance of governance units

Performance level	Number of units	% of units
Very Poor or Poor	13	10%
Marginal	59	45 %
Average	30	23%
Satisfactory	27	21%
Desirable	1	Less than 1 %

The performance regime at NRM South was evaluated as satisfactory, which was the highest in the entire Tasmanian governance system. The Tasmanian State Government (identified as the most influential body in coastal governance in Section 5.2) had an average performance, almost equal to the Australian Government. Finally, local governments delivered a better performance compared to the Australian and Tasmanian Governments (Table 5.6).

Table 5.6. Average performance values of each governance level

Governance Level	Average performance value
Australian Government level	1.6
Tasmanian Government level	1.8
Local Government level	2.4
Regional NRM level	2.6

5.3. Tasmanian coastal governance resilience capacity: A qualitative evaluation

This section examines the resilience capacity of the current Tasmanian coastal governance. According to the analysis, the resilience capacity of Tasmanian coastal governance depends on two variables: attribute importance and organisational performance. Because almost all the attributes had a substantial level of importance, an assumption was established that resilience capacity mainly depends on how the attributes are performed across the levels of governance (organisational performance).

A classification was developed by the researcher to describe the different levels of resilience (or degree of resilience capacity) (Table 5.7). An additional set of criteria was established to classify both performance and importance for each organisation/unit (Table 5.8). Finally, the extent to which an organisation/unit supports resilience was evaluated (Table 5.9).

Table 5.7. Classification of resilience capacity

Resilience capacity	Definition
Desirable	A coastal governance arrangement with this mode of resilience capacity can deliver pro-active and effective responses for systems adaptability and transformability. This form governance arrangement is not risk-averse and embraces changes and uncertainty. This is desirable, yet an achievable mode of resilience that needs to be delivered in the long term.
Adequate	This mode of resilience capacity supports a pro-active adaptability and is able to deliver highly responsive adaptation decision. However, transformational decisions require a substantial level of enhancement. As a result, transformation responses would be mostly simple, delayed and re-active. A system in this mode of resilience capacity might not be adequately capable of surviving radical changes and shocks. This mode is the minimum level of resilience capacity or development of a resilience-based coastal governance.
Marginal	In a coastal governance arrangement with this level of resilience capacity, adaptational responses are inadequate and mostly reactive. Transformation capacity does not exist or is very low. The system fails to provide an appropriate response to transformational drivers and would collapse if transformational changes occur.
Pre-resilience	A coastal governance arrangement in this mode does not have any recognisable level of resilience capacity. The attributes regime in this mode may deliver a basic level of adaptation responses, but adaptability is fragile, and the system could easily fail to adapt to incremental changes even in the short term. There is not a recognisable level of transformation capacity in such a governance arrangement.
No resilience	No resilience capacity exists

Table 5.8. Classification of organisational performance and importance against levels of resilience

Attributes Importance		Organisational performance				
		Mean> 3	3 ≥ Mean> 2.5	2.5 ≥ Mean> 2	2 ≥ Mean>1.5	Mean ≤ 1.5
	VI	Desirable	Adequate	Marginal	Pre-resilience	No Resilience
	I	Desirable	Adequate	Marginal	Pre-resilience	No Resilience
	MI	Desirable	Adequate	Adequate	Marginal	No Resilience

VI – Very Important, I – Important, MI -= Moderately Important

Table 5.9. Evaluation of resilience capacity in Tasmanian coastal governance

		Attribute importance	Attribute performance	Resilience capacity
DOE	Knowledge management processes	Important	2.1	Marginal
	Diversity of expertise	Important	2.1	Marginal
	Knowledge sharing mechanisms	Important	2.1	Marginal
	Knowledge acquisition mechanism	Important	1.9	Pre-Resilience
	Transparent decision-making processes	Important	1.8	Pre-Resilience
	Organisational learning	Very Important	1.6	Pre-Resilience
	Adaptive planning / management cycle	Important	1.6	Pre-Resilience
	Conflict resolution mechanisms	Important	1.6	Pre-Resilience
	Stakeholder engagement processes	Important	1.6	Pre-Resilience
	Leadership for change	Very Important	1.5	No Resilience
	Organisational flexibility	Important	1.5	No Resilience
	Leadership for securing outcomes	Important	1.4	No Resilience
DPAC	Knowledge management processes	Very Important	2	Pre-Resilience
	Knowledge sharing mechanisms	Very Important	2	Pre-Resilience
	Knowledge acquisition mechanism	Very Important	1.9	Pre-Resilience
	Diversity of expertise	Very Important	1.9	Pre-Resilience
	Transparent decision-making processes	Very Important	1.8	Pre-Resilience
	Organisational learning	Very Important	1.7	Pre-Resilience
	Leadership for change	Very Important	1.7	Pre-Resilience
	Stakeholder engagement processes	Very Important	1.7	Pre-Resilience
	Organisational flexibility	Important	1.7	Pre-Resilience
	Conflict resolution mechanisms	Important	1.7	Pre-Resilience
	Leadership for securing outcomes	Very Important	1.6	Pre-Resilience
	Adaptive planning / management cycle	Very Important	1.5	No Resilience
DPIPWE	Knowledge management processes	Very Important	2.4	Marginal
	Diversity of expertise	Very Important	2.4	Marginal
	Knowledge sharing mechanisms	Very Important	2.4	Marginal
	Knowledge acquisition mechanism	Very Important	2.2	Marginal
	Organisational learning	Very Important	2	Pre-Resilience
	Transparent decision-making processes	Very Important	1.9	Pre-Resilience
	Stakeholder engagement processes	Very Important	1.9	Pre-Resilience
	Organisational flexibility	Important	1.9	Pre-Resilience
	Leadership for securing outcomes	Very Important	1.8	Pre-Resilience
	Adaptive planning / management cycle	Very Important	1.8	Pre-Resilience
	Conflict resolution mechanisms	Important	1.8	Pre-Resilience
	Leadership for change	Very Important	1.7	Pre-Resilience
TPC	Transparent decision-making processes	Very Important	2.1	Marginal
	Diversity of expertise	Very Important	2	Pre-Resilience
	Conflict resolution mechanisms	Important	2	Pre-Resilience
	Knowledge management processes	Very Important	1.9	Pre-Resilience
	Knowledge acquisition mechanism	Very Important	1.9	Pre-Resilience
	Knowledge sharing mechanisms	Very Important	1.9	Pre-Resilience
	Organisational learning	Very Important	1.8	Pre-Resilience
	Stakeholder engagement processes	Very Important	1.7	Pre-Resilience
	Leadership for change	Very Important	1.5	No Resilience
	Adaptive planning / management cycle	Very Important	1.5	No Resilience
	Organisational flexibility	Important	1.5	No Resilience
	Leadership for securing outcomes	Very Important	1.4	No Resilience

		Attribute importance	Attribute performance	Resilience capacity
Clarence Council	Leadership for change	Important	3.1	Desirable
	Knowledge acquisition mechanism	Important	2.9	Adequate
	Organisational learning	Very Important	2.8	Adequate
	Transparent decision-making processes	Very Important	2.8	Adequate
	Stakeholder engagement processes	Very Important	2.8	Adequate
	Leadership for securing outcomes	Important	2.8	Adequate
	Knowledge sharing mechanisms	Important	2.8	Adequate
	Knowledge management processes	Important	2.8	Adequate
	Diversity of expertise	Important	2.7	Adequate
	Adaptive planning / management cycle	Very Important	2.5	Marginal
	Conflict resolution mechanisms	Very Important	2.5	Marginal
	Organisational flexibility	Important	2.5	Marginal
Kingborough Council	Organisational learning	Very Important	2.9	Adequate
	Leadership for change	Important	2.9	Adequate
	Knowledge acquisition mechanism	Important	2.9	Adequate
	Knowledge management processes	Important	2.8	Adequate
	Transparent decision-making processes	Very Important	2.7	Adequate
	Leadership for securing outcomes	Important	2.7	Adequate
	Diversity of expertise	Important	2.7	Adequate
	Stakeholder engagement processes	Very Important	2.6	Adequate
	Knowledge sharing mechanisms	Important	2.6	Adequate
	Adaptive planning / management cycle	Very Important	2.5	Marginal
	Organisational flexibility	Important	2.5	Marginal
	Conflict resolution mechanisms	Very Important	2.4	Marginal
Huon Valley Council	Organisational learning	Very Important	1.9	Pre-Resilience
	Transparent decision-making processes	Very Important	1.8	Pre-Resilience
	Stakeholder engagement processes	Very Important	1.8	Pre-Resilience
	Conflict resolution mechanisms	Very Important	1.8	Pre-Resilience
	Knowledge acquisition mechanism	Important	1.8	Pre-Resilience
	Leadership for securing outcomes	Important	1.8	Pre-Resilience
	Knowledge sharing mechanisms	Important	1.7	Pre-Resilience
	Knowledge management processes	Important	1.7	Pre-Resilience
	Leadership for change	Important	1.6	Pre-Resilience
	Diversity of expertise	Important	1.6	Pre-Resilience
	Organisational flexibility	Important	1.6	Pre-Resilience
	Adaptive planning / management cycle	Very Important	1.5	No Resilience
NRM South	Knowledge sharing mechanisms	Important	2.7	Adequate
	Diversity of expertise	Important	2.7	Adequate
	Stakeholder engagement processes	Important	2.7	Adequate
	Leadership for change	Important	2.7	Adequate
	Organisational learning	Very Important	2.6	Adequate
	Leadership for securing outcomes	Important	2.6	Adequate
	Organisational flexibility	Important	2.6	Adequate
	Knowledge acquisition mechanism	Important	2.6	Adequate
	Transparent decision-making processes	Important	2.6	Adequate
	Knowledge management processes	Important	2.5	Marginal
	Adaptive planning / management cycle	Important	2.4	Marginal
	Conflict resolution mechanisms	Important	2.3	Marginal

		Attribute importance	Attribute performance	Resilience capacity
Supportive Legislation	AG	Important	1.5	No Resilience
	TG	Very Important	1.3	No Resilience
Distribution of power	AG - TG	Important	3	Adequate
	NRM - LG	Important	2.1	Marginal
	TG - NRM	Mod. Important	1.8	Marginal
	AG - NRM	Mod. Important	1.8	Marginal
	TG - LG	Important	1.7	Pre-Resilience
Organisation cooperation and coordination	NRM - Community Groups	Important	2.5	Marginal
	NRM - LG	Important	2.4	Marginal
	LG - Community Groups	Important	2.3	Marginal
	NRM - NGOs	Important	2.2	Marginal
	LG - LG	Important	2.1	Marginal
	TG - NRM	Important	2.1	Marginal
	AG- Regional NRM	Important	2	Pre-Resilience
	TG - LG	Very Important	1.9	Pre-Resilience
	TG - Business Sector	Important	1.8	Pre-Resilience
	NRM - Business Sector	Important	1.8	Pre-Resilience
	AG - TG	Important	1.7	Pre-Resilience
	LG - Business Sector	Important	1.7	Pre-Resilience
	LG - NGOs	Important	1.7	Pre-Resilience
	TG - Community Groups	Important	1.4	No Resilience
	TG - NGOs	Important	1.4	No Resilience
Organisation partnerships	Regional NRM - LGs	Important	2.5	Marginal
	Regional NRM - NGOs	Important	2.5	Marginal
	LGs - LGs	Important	2.2	Marginal
	TG - Regional NRM	Important	2.1	Marginal
	AG- Regional NRM	Important	2.1	Marginal
	Regional NRM - Business Sector	Important	1.9	Pre-Resilience
	TG - LGs	Very Important	1.8	Pre-Resilience
	LG - NGOs	Important	1.8	Pre-Resilience
	AG-TG	Important	1.7	Pre-Resilience
	LG - Business Sector	Important	1.7	Pre-Resilience
	TG - Business Sector	Important	1.6	Pre-Resilience
	TG - NGOs	Important	1.4	No Resilience

The findings revealed that in nearly half of the situations (45%) the attributes did not support any mode of resilience capacity in the entire governance system (Table 5.10). Only in 28 per cent of the situations, the attributes contributed to an adequate or a higher mode of resilience. Further, there was no organisation where the entire attributes regime supported an adequate or a higher mode of resilience. Generally, organisations at local and regional levels showed a higher resilience capacity. For example, at least 75 per cent of the attribute regime at Clarence and Kingborough Councils and NRM South supported an

adequate or a higher degree of resilience capacity. The rest of the units at these organisations were in the marginal mode.

At the Australian Government level, none of the attributes was in an adequate or a higher degree of resilience capacity (Table 5.10). Almost half of the attributes were in a pre-resilience mode. These attributes included transparent decision-making processes, organisational learning, adaptive planning and management cycle and conflict resolution mechanisms. Despite significant importance of leadership for change at higher levels of governance, leadership for change and securing outcomes did not support any mode of resilience at an Australian Government level.

Although the State Government was particularly influential in Tasmanian coastal governance, attributes regime at this level did not acceptability contributing or supporting a mode of resilience. Except for transparent decision-making processes at TPC that supported a marginal mode of resilience, the rest of the attributes at DPaC and TPC were in the pre-resilience or no resilience modes. DPIPWE had a slightly higher position compared with other two agencies. Almost 75 per cent of the attributes at DPIPWE fell into a pre-resilience mode, and the rest of them only support a marginal resilience capacity.

At a regional level, almost 75 per cent the attributes regime supported an adequate mode of resilience. At NRM South, adaptive planning and management cycle, conflict resolution mechanisms, and knowledge management processes were in a marginal mode. In order to enhance the resilience capacity of the Tasmanian coastal governance, performance regime for these important attributes requires an improvement on a regional level.

At a local government level, the attributes regimes at Clarence and Kingborough Councils were significantly in a better condition than the federal and state levels. At Kingborough Council, adaptive planning and management cycle, organisational flexibility and conflict resolution mechanisms supported a marginal mode of resilience capacity. On the other hand, at Huon Valley Council, the condition of attributes regime was considerably lower than the other two councils. At Huon Valley Council 11 out of 12 attributes were evaluated as pre-resilience, and adaptive planning and management cycle was in a no-resilience mode.

Finally, on an inter-organisational scale, the attribute regime was indicated to be unsatisfactory. Organisational cooperation and coordination and partnership supported marginal or lower mode of resilience capacity. An overview of the organisational attributes regime and resilience capacity of the Tasmanian coastal governance system is provided in Table 5.10.

5.4. Chapter Summary

This chapter presented findings of the survey analysis regarding the significance of the selected attributes and associated regime performance for developing a resilience-based Tasmanian coastal governance. According to the findings, all the 16 attributes had a degree of importance for all units of analysis, with most being Very Important or Important, and only two Moderately Important. Organisational learning was Very Important for all governance levels, and is the most significant attribute in enhancing resilience capacity.

The analysis showed that none of the attributes at the Australian Government level was supporting an adequate degree of resilience capacity. Despite the significant importance of leadership for change at higher levels of governance, performance against this attribute was low. The Tasmanian Sate Government and local councils were the most influential governance bodies. However, despite their highly influential role, the State Government failed to deliver an appropriate level of resilience capacity. In contrast, NRM South and Clarence and Kingborough Councils demonstrated better performance. At a regional level, almost 75 per cent the attributes regime supported an adequate mode of resilience. At a local government level, the Clarence and Kingborough Councils were significantly better performed than organisations at the federal or State levels. However, for Huon Valley Council 11 out of 12 attributes were evaluated as ‘pre-resilience’.

Nearly half of the attributes regime (45%) in the governance system did not support any level of resilience capacity. Only in 28 per cent of the situations, the attributes contributed an adequate or a higher level of resilience (mainly at local and regional levels). The level of resilience capacity in the current Tasmanian coastal governance is low and requires significant improvement.

Table 5.10. Organisational resilience capacity by attributes

	Desirable	Adequate	Marginal	Pre-resilience	No Resilience
DOE	0	0	3 (25%) knowledge management processes, diversity of expertise, knowledge sharing mechanisms	6 (50%) knowledge acquisition mechanism, transparent decision-making processes, organisational learning, adaptive planning and management cycle, conflict resolution mechanisms, Stakeholder engagement processes	3 (25%) leadership for change, organisational flexibility, leadership for securing outcomes
DPaC	0	0	0	11 (92%) all the attributes except adaptive planning and management cycle	1 (8%) adaptive planning and management cycle
DPIPWE	0	0	3 (25%) knowledge management processes, diversity of expertise, knowledge sharing mechanisms	9 (75%) the rest of the attributes	0
TPC	0	0	1 (8%) transparent decision-making processes	7 (59%) diversity of expertise, conflict resolution mechanisms, knowledge management processes, knowledge acquisition mechanism, knowledge sharing mechanisms, organisational learning, stakeholder engagement processes	4 (33%) leadership for change, adaptive planning and management cycle, organisational flexibility, leadership for securing outcomes
Clarence Council	1 (8%) leadership for change	8 (67%) knowledge acquisition mechanism, organisational learning, transparent decision-making processes, stakeholder engagement processes, leadership for securing outcomes, knowledge sharing mechanisms, knowledge management processes, diversity of expertise	3 (25%) adaptive planning and management cycle, organisational flexibility, conflict resolution mechanisms	0	0
Kingborough Council	0	9 (75%) leadership for change, knowledge acquisition, learning, transparent decision-making processes, stakeholder engagement processes, leadership for securing outcomes, knowledge sharing, knowledge management processes, diversity of expertise	3 (25%) adaptive planning and management cycle, organisational flexibility, conflict resolution mechanisms	0	0

	Desirable	Adequate	Marginal	Pre-resilience	No Resilience
Huon Valley Council	0	0	0	11 (92%) all the attributes except adaptive planning and management cycle	1 (8%) adaptive planning and management cycle
NRM South		9 (75%) leadership for change, knowledge acquisition mechanism, organisational learning, transparent decision-making processes, stakeholder engagement processes, leadership for securing outcomes, knowledge sharing mechanisms, organisational flexibility, diversity of expertise	3 (25%) adaptive planning and management cycle, conflict resolution mechanisms, Knowledge management processes	0	0
Supportive legislation	0	0	0	0	AG, TG
Distribution of power	0	1 (20%) AG - TG	3 (60%) NRM – LG, TG – NRM, AG - NRM	1 (20%) TG - LG	0
Organisational cooperation and coordination	0	0	6 (40%) NRM - Community Groups, NRM – LG, LG - Community Groups, NRM – NGOs, LG - LG TG - NRM	7 (47%) AG- Regional NRM, TG – LG, TG – Business, Sector, NRM - Business Sector, AG – TG, LG - Business Sector, LG - NGOs	2 (13%) TG - Community Groups, TG - NGOs
Organisational partnerships	0	0	5 (42%) Regional NRM – LGs, Regional NRM – NGOs, LGs – LGs, TG - Regional NRM, AG- Regional NRM	6 (50%) Regional NRM - Business Sector, TG – LGs; LG – NGOs, AG-TG, LG - Business Sector, TG - Business Sector	1 (8%) TG - NGOs
Tasmanian coastal governance system	1 (Less than 1%)	27 (21%)	31 (24%)	14 (10%)	57 (44%)

Chapter 6. **Interview analysis**

This chapter presents an analysis of the interview data and related results. Five analytical themes were used to code (group) the interview data. These themes were identified according to the types of information required to achieve the research objectives. The themes were: influential organisations and the mechanisms of their influence on coastal governance; drivers of change that potentially influence Tasmanian coastal areas; adaptation capacity of the regime; transformation capacity of the regime; and participants' interpretations of the resilience thinking framework and its implications for guiding coastal governance design. Throughout the chapter, quotes from interview transcripts are indicated by a bracketed number to retain anonymity.

6.1. Organisational arrangements and the areas of influence

Participants were asked to identify the main organisations influencing the Tasmanian coastal SES. Some respondents suggested that assessing the organisational influence on Tasmanian coastal governance was cumbersome and the results could be unclear and misleading. These interviewees indicated that due to the embedded complexity of coastal SESs and the dynamics of coastal governance arrangements in Tasmania, identification of organisational roles and responsibilities is difficult. For example, a respondent argued that: "it is very hard to say [indicate influential organisations] because the departmental structures vary and with the new government it is going to vary again" (int. 108).

Nonetheless, an overall analysis suggested a variety of influential organisations on multiple levels. The Tasmanian State Government and local councils had a greater influence than others. Also, the results revealed that the significance of organisational influence depends on the level of the organisation and their statutory accountability. For example, although, local councils had a strong role in improving public engagement and conflict resolution processes, they have no accountability for developing a supportive legislation framework. The following subsections discuss organisational influences on Tasmanian coastal governance.

6.1.1. **Australian Government**

A considerable number of the participants argued that the direct influence of the Australian Government on Tasmanian coastal governance is through some statutory instruments such as administering the EPBC Act. However, this influence has limited applications on State scale decision-making. In this respect, one respondent argued: “this influence [through EPBC Act] only takes place when a development proposal, on the scale of the EPBC Act, is put forward. As these proposals do not come up that often, the Australian Government does not play a big role then” (int. 101).

The interview analysis showed that a major influence of the Federal Government occurs through its responsibility for delivering overarching directions and guidelines. Some respondents argued that the Federal Government should take more leadership in delivering effective national scale coastal policies and strategic plans. For example, one interviewee thought that “initially, I would say on the climate adaptation side, the Federal Government should take more of the lead that it does. It should happen in the form of overarching policy” (int. 108).

Regulatory mechanisms to control coastal development were another key instrument of influence at a federal level. For example, one participant argued that the Federal Government could control national scale regulations that have a high impact on coastal development. In this respect, interviewee 105 argued: “A good example is the Federal Government has a body called APRA. It is a body to regulate insurance; there is no requirement by APRA that ask insurers what are their risks for climate change and how they are going to be managing those [risks]? So, in this bigger picture, there is a role for Federal Government [to regulate these areas]”.

Providing financial, technological and informational support to other levels was another significant area of Australian Government influence. For example, the analysis indicated that the Australian Government could influence coastal decision-making through its role in providing financial assistance to develop coastal research and implementation projects at other levels. As an interviewee stated: “the Federal Government has less influence on the ground, but they have a big role on policy issues across the country and how they can assist

them [local governments] to implement a consistent policy through funding projects" (int. 117).

6.1.2. **Tasmanian Government**

Tasmanian State Government is the main governance body that has the most significant statutory role in Tasmanian coastal decision-making, policy development, planning and management. As a result, the State Government was seen as highly influential in coastal governance. According to the analysis, DPIPWE, DPAC and TPC were the most influential agencies of the State Government. The influence of DPIPWE rises from its statutory role in administering a number of environmental legislation and regulations such as *National Parks and Reserves Management Act 2002*. DPAC influences coastal governance through its leadership role in the process of coastal policy-making.

The role of the TPC in coastal governance was more controversial than the other two agencies. Some participants indicated that TPC influence is through its role in developing a state-level planning structure. For example, a TPC respondent argued that: "we have a responsibility in terms of the assessment of changes to the planning rules. So, we do that in a strict statutory framework. A planning scheme basically needs to comply with the state policy, and we review and approve proposed amendments to the planning rules, including those that may affect coastal areas" (int. 121). Another participant addressed a more indirect role of TPC as interviewee 111 indicated: "clearly they have a role, but I am not sure quite what they role is apart from [their] planning decisions; perhaps they would be better placed to take a more integrated leadership role".

Another influence was the role of Tasmanian Government in developing new legislative frameworks as well as implementing the existing ones more effectively. For example, the responsibility of the State Government to develop a clear, responsive and overarching coastal policy was frequently addressed by participants. In addition, some respondents argued that despite the significant drawbacks of TSCP 1996, the State Government should effectively implement instead of disregarding the policy. For example, an interviewee stated that: "the coastal policy has been discredited and it was the deliberate intention of some [people] in the State Government and also some industry groups. Some councils think because it has been under review for a long time then it does not apply anymore" (int.101).

Providing political, financial and technological support to other organisations were other areas of influence of Tasmanian Government. The analysis revealed the different mechanisms that the Tasmanian Government can affect regional NRMs, local councils and NGOs in their decision-making processes. An interviewee argued that: “the State Government’s role here is providing policy settings that sit within the State Government remit, and also providing that support to local councils and being clear about the roles between them. I have to say it is important that the State Government undertake its responsibility and support and delivers its responsibility and do not let local councils go it alone” (int. 123).

6.1.3. **Local Governments**

According to the findings, local councils were other influential organisations in Tasmanian coastal governance arrangement. Most of the participants indicated that Tasmanian coastal governance is a shared responsibility mainly between the State and local governments. While Tasmanian Government had a higher influence on state-level decision-making, local councils were more influential on local scale planning and management issues. Three main local council areas of influence were routine coastal management activities, land use planning and development approvals at a local level, and facilitating community engagements processes.

Some interviewees claimed that local councils have more influence than other organisations. For example, one interviewee stated that: “local governments by far have the most influence and responsibility because they are the ones that are directly responsible for what happens in coastal zones” (int. 102). However, some other participants argued that the high influence of local council is limited to a number of areas such as improving public participation and problem-solving processes. As respondent 123 said: “I would say that the local government is at the forefront [of coastal governed] here in terms of some of the planning decision, liaising directly with that community” (int. 123”).

In addition to these three levels of governments (Federal, State and local), there were indications to other influential organisations such as NRM, industries and private businesses (i.e. tour operators, oyster and fish farm industries), NGOs, community groups and private landholders. For example, a respondent indicated that: “here are also some private

landowners that have high water mark titles. A number of industries have the right to extract or require passage across coastal waters or public coastal land; so, there are a number of private interests" (int. 101). However, the frequency of these indications was not significant compared with government organisations.

Finally, in this section, the participants were asked to evaluate the capacity of the various levels of governance to fulfil their roles and responsibilities. The overall analysis showed that the majority of the participants indicated that local councils were delivering a more effective performance than the other two levels. For example, a participant argued that: "regarding the lack of funding and leadership in Federal Government and State Governments, local councils are taking up the leadership in coastal governance, and some of the coastal councils are doing really well because they have the resource base from their electorate and some are struggling because they don't have resources" (int. 107).

The main reasons for the unsatisfactory capacity of the Federal and State Governments were: being in the state of denial (regarding climate change and sea level rise), lack of holistic and long-term vision, lack of fit and scale mismatches in coastal decision-making and the dominance of neoliberal approach in coastal governance. For example, an interviewee addressed the domination of efficiency-based and neoliberal thinking and stated that:

> but, the tenure of the Federal Government at any particular time sets that sort of level of discourse around which policy is formed within the State or local government context. So, the current federal government with a much fairer approach to development and job creation at the expense of the environment gives levy to other players to operate in a different mode and creates a sort of discursive space, where the possibilities for development are much greater. So, the weight goes more firmly towards those sectors (int. 119)

6.2. Potential drivers of change

This section considers the actual and potential drivers of change in the Tasmanian coastal SES. Key drivers were either environment-oriented or social-oriented. Environment-oriented drivers were the most frequently mentioned threat factors impacting the Tasmanian coastal SES. Climate change, sea level rise, storm surge and coastal erosion were identified as key environment-oriented drivers. Environmental pollution (including marine debris and plastic

pollution), invasive species (such as weeds) and ocean acidification were among other threat drivers.

It was perceived that the identification of threat drivers at a local scale was an ad-hoc process. However, the analysis revealed that some councils such as Clarence Council conducted a systematic risk assessment project to identify the influential drivers in their local area. For example, a participant from Clarence Council argued that:

> in [this] council we undertook a program looking at threats to the council, and we have identified around 150 risks associated with climate change, many of them were in coastal processes; and the big ones are coastal erosion and the things that rise from coastal erosion particularly in threatening assets and threatening environmental values around areas of high biodiversity and important environmental benefits (int. 120)

Social-oriented drivers referred to the drivers that are created by the human component or influence social systems of coastal SES. Poor leadership was the main driver in this category that causes weaknesses in Tasmanian coastal governance. In this regard, the domination of political and economic-based approaches in the leadership was frequently emphasised by the respondents. For example, an interviewee argued that: “the distribution of power within the government system lays within the capital and any concerns around maintaining amenity or ecological values within the coastal zone are always held up against those capital development concerns, with those concerns usually trembling any other values” (int. 119).

Lack of political will and support to respond to coastal challenges was another major social-oriented weakness of Tasmanian coastal governance. As respondent 104 said: “We already have a lot of frameworks in place, but what we do not have is the political will to implement and support them”. To address unclarity in roles and responsibilities in Tasmanian coastal arrangement participant 107 raised the following questions: “Who has what role? What are they doing, how we are working together [with]? What are we achieving under this policy?”

Non-supportive regulatory frameworks, lack of long-term vision and objectives, inappropriate intersectional and cross-scale collaboration and coordination, the inadequacy of financial and human resources and poor decision-making, policy development and planning systems were other major social-oriented weaknesses in the Tasmanian coastal

SES. For example, one participant indicated the weaknesses of Tasmanian decision-making system and argued:

> current decision-making processes are fragmented, disconnected and inconsistent. Although some people have the big picture, the decision-making process itself does not. The decision-making system is just dealing with the step by step incremental things without [any] reference to the big picture. Major decision-making is done at the local government level, and they only are thinking about it a little bit (int.104)

Furthermore, the interviews identified the key drivers of strengths and opportunities in Tasmanian coastal governance. To address environment-oriented drivers of strengths and opportunities, a number of the participants indicated that the lower risk of natural hazards in the Tasmanian coast (compare with other states) was a key factor. For example, a respondent argued that: "[t]here's public and private infrastructure under risk [of climate change and sea level rise], but my understanding is [in Tasmania] it is not significant as compared to other states" (int. 121).

Resilient coastal geomorphology was another environment-oriented driver that strengthens the coastal SES against the impacts of natural hazards and provides some future opportunities. The Interviewee 105 indicated**:** "as an example, half of the coastline here [at Kingborough Council area] is resilient to erosion; it is an opportunity to have resilient coastal properties". Having unique and special natural environment was another frequently mentioned opportunity as one participant mentioned: "we have the most scenic coastline and broadest environmental variants. Tasmania has got many touristic values without competition to get access to them, and that would be [a] huge value for the next generation" (int. 119).

The participants identified a number of major factors regarding social-oriented drivers of strengthens and opportunities. Improving public awareness and support was seen as one of the key strengths of Tasmanian coastal SES that provide for future opportunities. An interviewee stated that: "the rising awareness of local issues as consequences of the threat to the system and that sort of awareness can lead people to some sort of solution" (int. 120). The sense of commitment and belonging to place was another social-oriented driver as the interviewee 123 said: "one of the positives for Tasmania as a small place, is we share; people are committed to their place" (int. 120).

The lower intensity of coastal development compared with other states was an opportunity in the Tasmanian coastal SES. As a participant argued: “Fortunately, we are living in Tasmania, not NSW, development here in comparison to NSW is almost anything, and we have almost the sparsely developed coastline because of lack of development pressure” (int. 105). Also, reasonable availability of quality data was another strengthens that could facilitate the governance processes. To address this advantage, one respondent claimed that: “Chris Sharples has done good mapping on resilient coastal areas. That is good for the future development, and it is also good for something like we know where we can move people safely in case there are problems” (int. 108).

Finally, the findings revealed inconsistencies in the participants’ opinions about identifying threats and opportunities. While some respondents perceived a driver as a threat, others saw it differently. For example, lower development pressure mostly was specified as an opportunity as one respondent argued that “there are a lot of opportunities because Tasmania has such a lot of coastline. There are a lot of coastlines that still remained undeveloped” (int. 106). However, other respondents addressed less developed coastline as a potential threat factor: “having coastal areas that are not intensively developed is rather a threat than an opportunity, because it might be interpreted as because we have a lot of natural resources, we can afford to lose [some of it]” (int. 122).

6.3. Adaptability

This section examines the opinions of participants regarding the definitions of adaptation capacity, the performance regime in Tasmanian coastal governance and the requirements to enhance governance. A primary definition of adaptation capacity was first provided by the interviewer, and the participants were asked to comment on the definition (or provide their own definition). Next, respondents were requested to evaluate the existing regime in terms of adaptation capacity and identify barriers, opportunities and requirements to enhance adaptation capacity of Tasmanian coastal governance.

6.3.1. **Semantic analysis**

A semantic analysis showed a general inconsistency in the interpretations and understanding of adaptation capacity in the case study area. Some respondents had a more extensive explanation of adaptability, whereas, others provided a narrower and more

specific description of the concept.[10] A major interpretation of adaptation capacity was similar to the classic definition of resilience concept. According to this interpretation, an adaptable system is considered more resilient, as a participant argued: “in climate change space, we talk about adaptation in terms of being resilient or bouncing back from the impact of change” (int. 123). Another participant referred to the relation between adaptability and resilience and argued that adaptation capacity include: “[w]hat sort of management behaviours or management strategy we need to try effectively to make the systems more resilient to change” (int. 111).

Another stream of understanding addressed adaptation capacity as the ability to respond to change. In this regard, some interviewees saw adaptability as a reactive response to change, where an interviewee mentioned: “I have been seeing adaptation as the response … the adaptation you have to do; you are forced” (int. 104). However, most of the participants indicated that adaptability refers to the ability of a system to appreciate uncertainty and future requirements and proactively develop mechanisms to respond them. In this respect, a participant claimed that: “it is better to be responsive, but we can also predict it, so we can build the capacity to the system to say when the change occurs, let's move and address it in a different way” (int. 112).

Some participants indicated that adaptability is about responding to incremental changes, for example, interviewee 118 suggested: “in this case, adaptation is very much about being able to pre-empt change or to respond effectively to change. So, adaptation tends to be considered in terms of incremental and very much evolutionary Darwinian sense” (int. 118). In contrast, some others emphasised that adaptation not only addresses incremental changes, but also applies to rapid and transformational drivers: “I have been in an adaptation conference where they talked about incremental change and transformational change but they [were] both adaptation” (int. 121).

From another viewpoint, some interviewees defined adaptability as the ability to maintain the existing condition or to bounce back to the previous regime after a disturbance. This interpretation was more common within the climate change discourse. Interviewee 123,

[10]- It should be mentioned that some participants used the term ‘adaptation capacity’ equivalent to ‘adaptive capacity’**;** whereas, others acknowledged a slight conceptual and semantic difference between the two. As this issue is beyond the scope of this research, it would not be considered here.

with climate change adaption professional experience, indicated that: “in the climate change space, we talk about adaptation in terms of being resilient or bouncing back from the impact of change”. This understanding was disputed by a number of respondents who discussed that adaptability was also the ability to respond to newly emerging needs and create a new regime. One participant suggested that: “adaptation is also about being able to transform if it is needed” (int. 110).

Moreover, adaptation capacity was seen as the ability to mitigate, prolong and postpones the impacts of risks and hazards. To address this feature, respondent 103 argued that: “I think [adaptation is about] deferring the damage. It sounds like trying to maintain the status quo but the reason that I differentiate [it], is it is [about] an existing asset that you do not want to lose”. In other words, some participants defined adaptability as an estate of continuous and cross-scale transition: “maybe adaptation is like a state of being in a continuing transition at varying levels. Maybe adaptation is another form of transitioning. At some point, that transition may happen quicker than others that happen more incremental and slow” (int. 110).

Finally, some interviewees argued that adaptation capacity does not have a fixed and determined definition. They claimed that definition of adaptation capacity is not clear and depends on a number of factors including adaptation context and the nature of the drivers of change. For example, respondent 110 claimed that: “definition of adaptation capacity varies; depend on the nature of the threat and the degree of the vulnerability”. In addition, another participant argued that: “there is no one size fits all, so it is really hard to comment on the [adaptation] capacity because we have found that the area is quite different” (int. 108).

6.3.2. **Adaptability in Tasmanian coastal governance**

The interview analysis revealed the participant's opinions on the adaptability of Tasmanian coastal governance. In this respect, the participants identified the positives and the negatives of adaptation capacity in Tasmanian coastal governance. The existence of a degree of proactive leadership to improve adaptation capacity was identified as an opportunity. However, the findings showed that this leadership generally rested with smaller scale organisations such as local councils, NGOs and community groups. For

example, an interviewee stated that: “some of the positives are that there are leadership groups that are very proactive in this space [adaptation capacity]” (int. 123).

In addition, a degree of flexibility of the coastal governance system was indicated as another advantage. As it was argued, this flexibility opens the governance system to be more receptive to constructive feedbacks and influences from other stakeholders. Some interviewees addressed the incremental progress of adaptability of Tasmanian coastal governance system due to this flexibility. In this respect, a participant argued: “the system is slow, cumbersome and sometimes corrupted, but at least it is possible to influence it. The system is slow, but there is incremental progress going on. A lot of progress has happened over the last 40 years” (int. 104)

The increasing level of public awareness and engagement was identified as another advantage of present coastal governance arrangements. Some participants pointed out that because the impacts of coastal problems are getting more severe, the level of public awareness and concerns is increasing. Therefore, people have a better understanding of coastal problems and respond more proactively. For example, respondent 117 said: “there has been a greater awareness; people do have a better understanding than they had 20 years ago about what is happening in coastal areas and what are the risks” (int. 117).

Stability of the governance system and functionality of some aspects of the legislative framework were among the strengths factors. For example, interviewee 104 addressed the stability of the system and elaborated: “stability of the system is a positive; stability in terms of people know where to go, how to ask, there are some practices in place that have got community agreements” (int. 104).

In respect to the functionality of some aspects of legislation framework, a respondent argued: “we have got a lot in place; for example, our environmental management legislation is reasonably good. We do regulate our industries and their influence on water and air quality issues ... it is pretty well managed in compare to many parts of the world” (int. 101). Another local council participant said: “[the regulatory framework] is positive; there is no question about that. Positive in the sense of there is plenty of procedures in the regulatory area; both for the State and local levels to deal with the [environmental] issue” (int. 115).

Furthermore, the results of the analysis revealed some major adaptability problems of Tasmanian coastal governance. The lack of political will and support (mainly from federal and state level) and being in a "state of denial" were the most frequently mentioned weaknesses. According to the findings, these problems hinder the development of new adaptation responses and hurdles the implementation of the existing adaptation policies and strategies. To address the lack of political support, respondent 107 argued that:

> the current political climate is preventing the progression of adaptation capacity, the focus of the government at the moment is progressing development and economy, there is a lot of will and knowledge, but the political climate is limiting that.

Lack of holistic knowledge and understanding and the domination of risk-averse approaches in the leadership were two key barriers to improving an effective adaptation capacity in coastal governance. The results revealed that lack of knowledge and understanding about the coastal SES by the leadership would lead to fragmented and uninformed decision-making and policy development processes. As respondent 101 discussed:

> There is a huge range of styles of leadership, the quality of leadership in our elected representatives is very poor because you get very strong directive leaders who push through and that is the sort of leadership that I see in the government here. In my view, the State Government leadership was all about running an effective, risk-averse, smooth operation.

Lack of organisational communication, connectedness and partnership, the inappropriate regime of knowledge system (including knowledge sharing mechanisms) and lack of human and financial resources were other fundamental problems. For example, to address the lack of intersectional and cross-level collaboration and communication, interviewee 111 mentioned: "There is a lack of communication between different bodies ... Everyone is working in siloes. It is a huge problem, especially with the coastal areas. It is perceived that these problems hinder a holistic and collaborative coastal decision-making and policy development in the Tasmanian coastal area.

The inadequacy of legislative framework that supports the development and implementation of adaptation responses was another major concern. Some participants argued the lack of effective coastal policy that mandates incorporation of climate change

and sea level rise impacts in the process of coastal decision-making. For example, participant 121 addressed inadequate supportive legislation framework and said:

> At the moment the big gap is in terms of the state policies, we developed a system in the 1990s that anticipated having a lot of policy directions to the system, to the people who are making decisions in the system around a whole range of issues and we have not delivered that. We have only got 2 or 3 policies in place, and that is the gap most of the organisations agree on.

Furthermore, participants identified a number of interrelated drivers that influence adaptability of Tasmanian coastal governance. These drivers include inadequacy of implementation programs; lack of adaptive learning; slowness of the system to respond to the drivers of change, and reactiveness of adaptation responses. For example, the inadequacy of implementation programs prevents the process of acquisition of original information and hurdles the development of an appropriate knowledge system. This problem decreases the capacity of adaptive learning and creates a slow-responding system in which most of the adaptation responses are reactive. To address the inadequacy of implementation programs interviewee 112 stated that:

> Other things like the Tasmanian coastal adaptation pathways project, they are really good projects, but they failed, and they do not start to implement outcomes. There is all range of governance issue which the state needs to address about how you can implement these things, and it is not just about dollars.

Finally, increasing demands for coastal resources and conflicting values of the stakeholders were other key barriers to improving the adaptability of Tasmanian coastal governance. Influenced by the lack of appropriate knowledge and understanding and domination of political and economic approaches in the leadership, conflicting values of stakeholders would decrease the effectiveness of adaptation strategies in Tasmanian coastal governance. As a participant argued:

> Other things like the Tasmanian coastal adaptation pathways project, they are really good projects, but they failed, and they do not start to implement outcomes. There is all range of governance issue which the state needs to address about how you can implement these things, and it is not just about dollars (int. 112).

6.3.3. **Requirements for improving adaptability**

Issues related to leadership system were among the most frequently addressed themes of requirements for improving adaptability. The need for a holistic and inclusive approach and the ability of "complexity thinking" in the leadership mindset are examples. Some interviewees discussed that an appropriate understanding of the complexity of coastal SES and uncertainty of drivers of change enables the leadership to have a clear vision, set out long-term objectives and develop strategies that are more effective.

Some participants stated that a leadership system with a holistic vision and complexity thinking has a good recognition of risk and vulnerability, but is not risk-averse. This ability assists the leadership in recognising the plausible drivers of change and developing effective strategies to respond them. As one respondent said: "it is also [the] recognition of vulnerability and preparedness to take a long view and look and work out what is needed to be done and how they could be addressed" (int.113).

Inclusiveness of the leadership approaches and accounting for multiple values in the decision-making process were other essential requirements. Instead of domination of political and economic-based approaches, this inclusive leadership aims to balance the different values from a broader range of stakeholders. To address this issue, participant 101 argued: "so, the leadership needs to be inclusive. It needs to recognise the values of the human resources you have available, and it needs to bring people together towards a common goal and a common vision".

Moreover, understanding panarchial relations and facilitating intersectional and cross-scale collaboration and communication were indicated as other important requirements. The ability to practice collaborative and democratic governance rather than having hierarchical, top-down and prescriptive attitudes would improve the adaptability of Tasmanian coastal governance. As one interviewee discussed: "good strong relationships and memorandum of understanding and institutional understanding with all of the key actors [is required]" (int. 105).

The political will and support to develop and implement adaptation strategies were among other indicated factors. The political leadership in Tasmanian coastal governance is required to support developing adaptation strategies and implementation of associated plans and

programs. Implementing adaptation strategies improves the quality of knowledge system; promotes evaluation and monitoring mechanism and enhances adaptive learning capacity of the governance.

Furthermore, to address the needs for enhancing adaptation capacity, interviewees indicated a requirement for a reformed and improved decision-making and planning system. This reformed system should be flexible, proactive, communicative and collaborative and have a strategic viewpoint. For example, some respondents emphasised developing a flexible decision-making process and suggested that the flexible decision-making system should be able to adjust the processes of decision making with updated information. This flexibility enhances the scenario planning capacity to deal with rapid drivers. As respondent 106 said:

> flexibility is needed in terms of being able to change the decision-making process if new information is available. Sea-level rise is a good example in terms of the modelling that has been done in sea level rise allowances. Local governments need to be flexible enough to adapt their decisions and planning schemes regarding the changes in sea level rise allowance measurements.

An enhanced knowledge system that facilitates adaptational decision-making was another main requirement for improving the adaptability of the coastal governance system. A number of participants argued the importance of the availability of quality data and information as interviewee 111 discussed: “we need really good information and science to underpin all the decisions and inform all the planning and policy process”. In addition, some respondents indicated to the essential role of professional and organisational education. To address this issue, one participant discussed: “education and engagement are other important criteria, including education of elected representatives and local council staff. We have very poor uptake of science education” (int. 101).

Supportive legislation and a regulatory framework were frequently addressed as another key attribute. Most of the participants identified the necessity of overarching and state scale legislation and regulatory framework (including policies, strategies, guidelines and plans) as an important requirement to enhance adaptation capacity. Participants argued that a supportive legislation and a regulatory framework should: have holistic and strategic approaches, take account of the increasing impact of climate change and sea level rise,

clarify organisational roles and responsibilities in regard to coastal decision-making, and consider intersectional and cross-scale collaboration and communication. As interviewee 114 stated:

> clear overarching framework that is consistent across everybody. It governs your regulation, communication and everything. So, they are in the same book, we know what we are dealing with, practical terms from the council's perspective, so we know what the framework is and what we should do when a developer is putting forward a proposal. So, there could be a certainty for all parties.

The finding showed that community education, awareness and engagement are also required for adaptation capacity enhancement. The participants addressed the strong relationship between these concept and synergic impacts of them on the adaptability of Tasmanian coastal governance. For example, it was indicated that public education improves community awareness about the consequences of climate change and sea level rise on their private properties, which in turn, will increase public engagement in the adaptation processes. As one interviewee stated: “education has a big role in adaptation. Less education makes it easier to manipulate people. Education increases the level of public awareness” (int. 123).

Finally, some participants argued the necessity of more leadership from NGOs and community groups. These interviewees indicated the lower legal entanglement for community groups to lead adaptation strategies, which increases the level of entrepreneurial leadership. In this respect, respondent 104 indicated that: “adaptation activities could be done by communities. Governments probably never do these activities, but they can support communities to do it. I look towards the NGO sector to take the leadership on. If NGOs can get enough public interest, the politicians will take notice and provide some leadership to them” (int. 104)

6.4. Transformability

This section analyses interview data and information with a focus on transformation capacity in Tasmanian coastal governance. A definition of transformation capacity was first provided to the participants and interviewees were then asked to comment on the definition or provide their interpretation of transformation capacity. Following this, participants’ views on the plausibility of transformational changes occurring in the

Tasmanian coastal SES weres explored. Finally, barriers, opportunities and requirements for enhancing transformation capacity were identified.

6.4.1. **Semantic analysis**

A semantic analysis showed that participants' perceptions of transformation capacity encompassed a broad range of definitions and features. Some interviewees perceived transformation as a simple term in a terminological context. This group of participants mainly addressed "transformational changes" or "transformational situation". According to this viewpoint, transformation is a feature of a driver that is rapid; or a particular situation that is disastrous. For example, participant 120 argued that:

> If [you] look at the worldwide examples, something like what happened in the last tsunami in Japan is really a good example. Where [is] the resilience of those people? ... It just inspires people to go above and beyond. It depends on how resilient they are to be rebuilt within that environment and accept the change occurred in that environment.

This interpretation did not characterise transformation as a distinct capacity of a system to bounce forward and create new trajectories. Thus, adaptation capacity is still required to "recover" a system (mainly) after transformational situation occurred. This interpretation, consider the transformation as a recovery capacity or an emergency response. As one participant discussed**:** "in terms of transformation, we could attempt to get it [the system] back to what we had and re-establish it, and historically that is a lot of what we have done certainly in landslide-base and bushfire-base" (int. 112).

A number of participants defined transformation as a part of adaptation processes. For example, interviewee 112 indicated that: "certainly it [transformation] is [a] part of adaptation". However, other participants argued that although the definitions of adaptability and transformability are interconnected, the divergences between these two capacities need more clarifications. In this regard, participant 116 argued: "the difference between adaptation capacity and transformation capacity is somewhat mute. It is important to investigate that. We can nurture these things because we need them for adaptation capacities, and then it is a matter of nurturing those capacities for adaptation will help transformation capacity".

Some perceptions of transformation capacity were aligned with the definitions of this thesis. In this regard, some interviewees defined resilience as a capacity of an SES to undergo fundamental changes and create new trajectories for system development. This interpretation was mostly provided by the participants in academia, who had more exposure to the resilience thinking literature. For example, respondent 116 stated that: "transformability is to be aware that the system that you are in has values that you are not happy with, and you want to change the system to something completely different".

The analysis recognised two distinct features of systems transformability including reactive or forced transformability and proactive or deliberate transformability. Reactive transformability referred to the ability of an SES to develop new system trajectories when the transformational drivers or situation already occurred. A reactive transformation capacity is typically defined as the ability to find opportunity in crisis. On the other hand, proactive transformability addresses the capacity of a system to undergo fundamental changes deliberately. Proactive transformability is mainly planned, more value-based and dealing with slower drivers (rather than rapidly acting shocks).

6.4.2. **Transformational drivers and the capacity to respond them**

Most of the interviewees considered that occurrence of transformational drivers is plausible in the Tasmanian coastal SES. The results showed that environment-oriented drivers such as flood, storm surge, bushfire and tsunami are considered the most likely triggers of transformational changes. In addition, the uncertainty of the future global economy, changes in the supply chain in the global food market, and changes in social-cultural values were examples of social-oriented drivers of transformation.

A significant number of participants approved the utility of transformation capacity in improving system resilience and the requirement to develop transformability in Tasmanian coastal governance. As one participant indicated: "I think what needs to happen in the coastal zone is a shift from thinking solely about adaptation capacity. Eventually, people need to think about transformation capacity" (int.116). According to the findings, the participants supposed that transformation capacity increases the level of preparedness of coastal governance arrangement to deal with growing uncertainty of drivers of changes such as climate change and sea level rise.

In terms of the existing regime of transformation capacity in Tasmanian coastal governance, some participants indicated that transformation capacity is ignored and is not on the current Tasmanian coastal governance agenda. A lack of transformation capacity is a common issue across the different levels of governance. Other respondents indicated a degree of transformation capacity in the current coastal governance. However, they mentioned that transformation capacity is low and not currently well placed. For example, a respondent claimed that: “I do not think there is enough transformational capacity. Transformation capacity is quite low” (int. 106).

6.4.3. **The regime of transformability in Tasmanian coastal governance**

Some interviewees indicated that availability of valid data and information is an advantage in improving the transformability of Tasmanian coastal governance. As one interviewee stated: “the pluses are we have gone a long way in developing good scientific tools, the stuff we have done on mapping and trying to get that science and keep it going, and climate modelling science is good” (int. 108). However, other participants addressed some of the weaknesses of the current knowledge system. For example, respondent 104 identified that knowledge sharing mechanisms are a drawback and stated: “we have a lot of knowledge. That knowledge is mainly confined to small groups of people; knowledge sharing is a big problem as many decision makers even are not aware of the existence of this knowledge”.

Some interviewees identified that because Tasmania is a small state, there are opportunities to facilitate organisational communication and collaboration across scales. According to the analysis, the simpler relations in smaller systems (such as Tasmanian coastal governance) facilitates the process of improving transformation capacity. The advantages of enhancing transformability in smaller systems are: the process of decision-making is easier and less complicated (due to a lower number of actors); internalising changes is faster; establishing organisational partnership and cooperation is simpler, and establishing intersectional, and cross-level communication and collaboration are less complicated. As one interviewee argued: “if there is a leader who is backed by a set of legal instruments, it [the system] can change in a year, it can change rapidly because it is small” (int. 105).

The existence of robust social connectivity was identified as a strength in developing transformability of Tasmanian coastal governance. Although the social capacity to

proactively improve SES transformability was a drawback, the potential level of social connectivity (within the social and community groups) was adequate to respond to the post-reactive transformational situation. For example, an interviewee indicated that: “when there is a catastrophe like a flood or fire, then the community is very responsive” (int. 101).

The analysis showed that the weaknesses and barriers of improving transformability of the Tasmanian coastal SES were similar to those identified for adaptation capacity. Issues related to leadership were the most frequently mentioned factors. Some participants addressed poor leadership from the Tasmanian Government and argued that the State Government has failed to deliver overarching guidelines and direction to facilitate informed coastal decision-making at other levels. For example, a local council interviewee stated that: “there needs to be more clear direction and information available from the State Government that we can facilitate it through in our community. But, they [State Government] do not generate [the directions] and [we] do everything for our community on behalf of the State Government” (int.114).

Some participants stated that domination of risk-averse approaches prevents entrepreneurial leadership, which is essential for system transformability. A number of the respondents argued that the current conservative leadership was biased towards political and economic interests. As transformation options mainly conflict with a conservative and risk adverse mindset, the leadership does not support transformational decision-making. As respondent 113 indicted: “Governments are designed to maintain the mechanisms which are beneficial for the big businesses not for the community”.

Lack of understanding and being in the state of denial were other key barriers. Participants claimed that the leadership does not have enough understanding of environmental issues and the severe impacts of environmental drivers such as climate change and sea level rise. This lack of understanding leads decision-makers to mostly focus on short-term issues (such as economic problems) and ignore (or postpone) long-term issues (such as climate change and sea level rise). In this respect, a participant argued that:

> at present, we live in a world that we cannot plan too far ahead, the political system is not driven to plan too far ahead. Unless there is a driver, and the only reason gives them the drivers is because every now and then

> we have these extraordinary events that make the system, the governance to think about it for a while.

Lack of a fair power distribution and collaborative decision-making were among the other barriers. Some interviewees claimed that that the process of decision-making and policy development in Tasmanian coastal governance is top-down, unfair and prescriptive. According to this hierarchical arrangement, most of the accountability and liability concentrates at the State and national levels. As a result, local councils, NGOs and community groups cannot influence coastal decision-making and policy development. For example, a considerable number of the respondents indicated that delegating more accountability to local governments and NGOs could improve transformation capacity of the entire governance system.

Lack of a supportive knowledge system was identified as a barrier to improving transformability of the coastal governance system. As the analysis showed, transformational decision-making requires the availability of accurate and current data, appropriate knowledge management and the existence of effective knowledge sharing mechanisms. Some participants argued that due to a lack of implementation programs the availability of first hand and updated information for transformational decisions was not adequate.

The results showed that existing legislation and regulatory frameworks are not supporting the process of enhancing transformation capacity. The interviewees indicated that the Tasmanian legislative framework is mostly silent, unresponsive and unclear about transformation responses. In addition, participants argued that the legislative and regulatory system is slow in responding. Thus, as transformation capacity mainly deals with the rapid drivers, the responsiveness of legislative system could be improved. As one participant argued: “[t]he the fact that it has taken six years to get through the interim planning process, suggests that it is difficult for transformation capacity to occur” (int. 106).

Lack of organisational connectedness and partnership, and inadequate social awareness and engagement mechanisms were other barriers to improving transformability of Tasmanian coastal governance. The analysis revealed that

inadequate intersectional and cross-scale communication and collaboration, as well as low public engagement mechanisms, have hindered the process of holistic and inclusive decision-making and restricted achieving a collaborative approach towards transformability. As respondent 123 said: “preparedness for transformation and how we evaluate, to me is about having the actors in place that have the connections and the knowledge and the authority to engage in the parts of decision-making process”.

6.4.4. **Requirements to create or improve transformability**

Attributes related to leadership system were the most frequently identified requirement for improving Tasmanian coastal governance transformability. Entrepreneurial aspects of leadership such as openness, creativity, imagination, courage and willingness to try something different were emphasised. Such leadership is not risk-averse and appreciates change and uncertainty. As participant 105 argued: “but we cannot do that [enhance transformation capacity] until we understand our risks and transformational capacity. That takes really brave leadership, and that takes somebody who is an entrepreneur and take risks. That entrepreneurial leadership always win”.

Having a holistic vision and inclusive leadership approach was another important requirement. The type of leadership to make transformational decisions needs to have a good understanding of the current situation, future scenarios and available pathways and trajectories to lead the system towards a desirable regime. This form of leadership should be inclusive and account for the complexity of coastal SESs, as well as consider a variety of interests and values in the process of decision-making and policy development. In this respect, respondent 106 discussed:

> another critical thing is, it is difficult to find a right term for that, vision is the word which is often used; but, actually I would use a word like a common purpose, because a collective vision makes one think that you can come up with a common vision for the particular area, but you've got diverse interests, and they are always going to be in conflict. But, you can agree to disagree, and that is the idea behind the common purpose and can help build the collaboration that we need.

Furthermore, the transformational leadership should be panarchial rather than hierarchical. Instead of encouraging top-down decision-making processes, this form of leadership should

facilitate intersectional and cross-level collaboration. For example, participant 123 argued that: “we need a bottom-up approach in the process of decision making. In this regard, the social cohesion should be established by the social groups, and the government need to stay away, and to enables the inhibitors for that social cohesion”. The findings suggest that panarchial leadership enhances the level democratic and fair governance.

In addition, there is a need for political will and support for the leadership to develop and implement transformability enhancement programs. As a participant stated: “political leadership is very important to turn those little incremental changes into transformative change” (int. 110). According to the results, leadership support could happen through a number of mechanisms including developing a supportive legislative framework as well as providing financial and technological support to other levels.

A supportive legislative and regulatory framework is another critical attribute in enhancing Tasmanian SES transformability. Participants mentioned that the domination of a risk-averse attitude in the current legislative system hinders the process of enhancing transformation capacity. Hence, a more entrepreneurial and flexible legislative framework is needed to allow novelty and innovation in decision-making and policy development. In addition, the availability of a clear and overarching regulatory framework (such as policies, guidelines and directions) could facilitate transformation capacity building. To address supportive legislative framework interviewee 107 argued: “legislation and policy framework is a key to transformation because it does provide clear guidelines and full picture”.

An appropriate level of understanding and availability of knowledge system that supports informed decision-making was identified as key requirements for system transformability. Without quality data and information, proper knowledge and understanding about the system states and future scenarios, as well as communicating the knowledge across scales, transformational decision-making could be risky and misleading. As participant 116 indicated: “as you move into the more uncertain territory and as the system starts to shift and crossing thresholds you need to be aware that these things are happening, and you need to have good ability to know what is happening in the system and to be aware of danger points”.

The necessity of public awareness, education and engagement were emphasised in the interviews. Public education would increase public awareness in regard to transformational situations and improves public participation. For instance, respondent 106 stated: “Clarence Council is a good example of getting the science and taking the community considerations on board. They were consultative very transparent, providing good information to the community, so they got less resistance from the communities”.

Moreover, some participants indicated that for an effective transformational capacity social and community groups could be given a leadership role. In this regard, governments should share responsibility with NGOs and community groups. According to the interviewees, social institutions have a more entrepreneurial attitude and are less likely to be trapped in conventional formal bureaucracy. As respondent 116 argued:

> the other thing, which comes from the fact that people responsible for biodiversity of private landholders, they are the one that needs to deal with in the future, transferring that to coastal context to me is that decision-makers and the people living there have a real stake in the outcome; so, the governance arrangement needs to be greater devolution of the responsibility, so that people how make the ultimate decision are brought along in this discussion rather than having a more top-down direction. It is a matter of that collaboration across scales enables the people on the ground who actually make decisions about coastal zone are aware of what's happening.

Table 6.1 shows participants’ opinions regarding other requirements for enhancing transformability of Tasmanian coastal governance.

Table 6.1. Other requirements for enhancing transformability of Tasmanian coastal governance

Requirements	Examples of references in the interviews
Institutional flexibility	"if the system is rigid and the thinking is rigid it is harder to transform" (int. 103).
Enhancing community resilience	"enhancing community resilience would enhance transformation capacity" (int. 110).
Adaptive learning capacity (adaptive planning and management cycle)	"the third thing is the ability to constantly learn and to constantly adapt as you learn" (int. 116).
Maintaining and enhancing system's complexity and diversity	"diversity of opinions, diversity of functions, diversity of experiences leadership all collective go together to make a coalition of capability" (int. 123).
Availability of resources (human, financial and technological)	"we should be looking at the whole lot of different options and our best option is innovative technologies. So, developing new technologies, sustainable technologies and innovative technologies. Like electric cars. Tasmania is one place that really should be introducing that" (int. 102).
Paradigm shift and change of values both in community and government	"transforming coastal system and the capacity for transformation in policy requires a transformation in politics and then in the community. To do that, you need to create a new polity, a new way of thinking within the community. It is not necessarily based solely on values. It is not a values discussion" (int. 119).

6.5. Resilience thinking framework

In this section, the interviewees' perceptions of a resilience thinking framework and its features are presented and analysed. The barriers and requirements to enhancing resilience capacity are then identified. The interviews focused on comparing the utility and application of a resilience thinking framework with a risk management approach.

6.5.1. Semantic analysis

The results revealed a diverse range of definitions of resilience ranging from resistance capacity to transformation capacity. A narrower interpretation defined resilience as the ability of a system to withstand changes, maintain the current value and interests or bounce back to the pre-disturbance condition. However, a more inclusive definition recognises transformability as an essential feature of resilience capacity.

For example, some participants identified resilience as a recovery capacity and the ability of a system to bounce back to the former state after being disrupted. As one participant argued: "resilience is the capacity of the system to bounce back or deal with negative impact; like the capacity of the system to recover from fire events or storms" (int. 107).

Although some interviewees indicated the potential of bouncing to a more progressive situation, they were more satisfied with the idea of bouncing back to the existing condition: “resilience is about bouncing back. But is it bouncing back to the current or to something that progresses it [the system]? I tend to think, at the moment, we are thinking around bouncing back to the current” (int. 123).

A considerable number of interviewees defined resilience as notion similar to adaptation (or adaptive) capacity. According to this interpretation, a resilient system can cope with uncertainty and adjust with drivers of change. As interviewee 108 stated: “but in the longer term, it [a resilient system] also has the capacity to adapt; having the adaptive capacity” (int. 108). Influenced by the classical resilience literature, this interpretation included transformability in the definition of the resilience capacity and understood resilience as a notion that hinders the application of transformation capacity. In this regard, a respondent argued: “at the moment resilience, what I think, is a barrier to transformational capacity. So, the definitions of resilience people talk about staying as the norm; whereas transformational capacity might mean doing things completely out of the box” (int. 105).

Another interpretation of resilience referred to system flexibility. Some participants argued that a flexible system has more resilience capacity as one interviewee argued: “to me, resilience means flexibility” (int. 121). Some other participants raised the ideas of stability, and system health and strength to address resilience capacity. In this respect, interviewee 114 claimed: “to me, resilience is a strength. So, you are basically putting your strength out to say: that is it, we have got to stop and do with this here” (int. 114).

In addition, some interviewees defined resilience capacity as the ability of a system to develop adaptation strategies to incremental drivers as well as transformation responses to the radical drivers of change. As respondent 112 stated: “for me, resilience is between adaptation and transformation, it is the ability to cope with change and then to change itself. You can mitigate it, you can resist it, and at a certain point, you can transform in the course of better change” (int. 112). Although this interpretation of resilience capacity was not regularly addressed in the early stages of the interview process, it was more acknowledged when the interview progressed.

The analysis revealed that some participants indicated that resilience thinking could deliver an epistemological shift in understanding about complex SESs and provide new rationality to analyse system dynamics. This was previously identified by Fazey (2010). Resilience thinking challenges the conventional risk-averse and economic efficiency-based approaches and encourages risk appreciation and effective based decision-making. As one respondent 116 argued:

> In our work with natural resource management agency across Australia, which are taking on board resilience thinking, one of the very strong feedback we 'e got was: it is a completely new way of looking at the world. It is a transformation in a way that people need to think; they need to think for uncertainties which are completely contrary to the whole focus on risk management and efficiency.

Furthermore, the analysis of the responses indicated that some participants defined resilience as an outcome rather than an approach: "I was considering resilience as an outcome. This is the first time that I have thought about that as an approach" (int. 107). As it was indicated in Chapter 3, this viewpoint is influenced by a vulnerability paradigm where resilience is a property of a social or ecological system. According to this perspective, the outcome of a series of management actions is to reduce system vulnerability and create systems that are more resilient.

An overall analysis showed three main interpretations of resilience capacity. The first defined resilience as property or a feature of the system that mainly related to engineering resilience, elasticity and recoverability. The second, which was the most frequent, referred to a capacity that enables a system to bounce back or adapted to change and remain resilient. The third interpretation argued that the last two explanations do not account for regime shift and progress. Therefore, this interpretation identified a need to develop a new concept (term) that appreciates transformability as well as adaptability.[11] As will be argued in Subsection 6.5.4, this interpretation of resilience could be utilised in developing an overarching framework to deal with the complexity and uncertainty of coastal decision-making, policy development and planning in the era of rapid change.

[11]- In this regard, Nicolas Nassim Taleb's (2012) concept of "anti-fragility" was proposed as a substitute to resilience.

6.5.2. **Resilience capacity in Tasmanian coastal governance**

The findings of the study showed a low level of resilience capacity in the current Tasmanian coastal governance system. The main barriers to improving resilience capacity as argued by the participants follow.

The domination of short-term political and economic attitudes and approaches. Existing short-term economic and efficiency-based attitudes in government leadership was considered to be a key problem in enhancing the resilience capacity of the coastal governance system. Domination of political interests and economic-based approaches prevent the application of resilience thinking. As one participant claimed: "one of the issues that we have found with policies, that build resilience, is that they often work according to efficiency logic. So, a lot of the times the vulnerability literature and risk management are about being targeted, being efficient, short resources; we need to think what we can do with short resources to protect" (int. 116). Another participant added:

> my first question is the coastal plan is designed to protect the interest of parties, so, it might not increase the resilience. The coastal policy has not been done because it keeps getting pressure from property developers who are trying to influence the coastal policy; so, I do not think it increases resilience. The coastal policy review process (like the planning review process) is too sympathetic to pressure groups (e.g. large developers), and only maybe a small percentage of people have the big influence (int. 105)

The absence of leadership for change. Prevailing risk-averse attitudes and the lack of openness and domination of command and control leadership approaches were identified as significant issues in enhancing resilience capacity in the Tasmanian coastal governance arrangements. One participant said: "risk and precision are easier for government and decision-makers to adopt than the sort of resilience capacity building exercise because risk management is about control" (int. 113). Participants indicated that government approaches to environmental and coastal governance are becoming unnecessarily risk-averse, and this risk-averse attitude prevents the incorporation of more progressive and reformist approaches. This point was previously argued by Eburn and Dovers (2013).

Lack of holistic understanding, complexity thinking and inclusive approaches. A partial and fragmented understanding of the structure and functions of coastal SESs was another main barrier to resilience capacity enhancement in Tasmanian coastal governance. For example,

interviewee 101 claimed that “you have to be a generalist; you have to think of all the different departments and responsibilities and try to make people talk together where it is important to talk together”. In this regard, some respondents argued that the existing coastal governance approaches were narrow, and did not include a broad variety of stakeholder interests and values in the coastal decision-making and policy development.

Conceptual ambiguity and theoretical complexity. Some participants considered that the theoretical complexity and ambiguity of a resilience framework makes it difficult to understand and apply in decision-making and planning processes. As the results of Chapter 3 showed, resilience thinking has sophisticated and multifaceted underpinnings (Fazey et al. 2007; Walker & Salt 2006). Some participants pointed to the difficulty of understanding resilience thinking and consequent implications for effective application to achieve practical outcomes. For example, participant 119 addressed these theoretical and implementation difficulties:

> the idea of resilience that has been constituted by Stockholm Resilience Alliance turns into an extremely unbounded system problem. So, If I was a resilience SES analyst and also have coastal systems here, I would include the governance system, I would include the animals that live along the coast and currents that run up and down the coast and will have an unbounded system which I just simply couldn’t analyse, and that is part of the problem we have. Because I do not necessarily know what we are talking about; Because we do not have a tightly bounded enough system... So, it is really hard to build a polity around it. This is why the language of trade-offs if effective; we can see how much of X and how much of Y; and resilience language as used in sort of complicated discussion which says now we need to have synergies, we need to develop our understanding of the interrelations between different components of the system. In many ways, you are setting yourself up for analysis-paralysis.

6.5.3. **Requirements to improve resilience capacity**

Issues related to leadership and governance, social and community engagement, the availability of a quality knowledge system and adaptive learning were frequently raised attributes by the interviewees as requirements for enhancing the resilience capacity of Tasmanian coastal governance. For example, attributes related to leadership and political will and support were commonly mentioned as requirements for improving resilience capacity. As one interviewee mentioned: “political will, policy and planning instruments are important to enhance the resilience” (int. 107).

In this regard, the interviewees put significant emphases on the capacity of leadership to deal with uncertainty, transformational changes and adaptive learning. A respondent argued: “so, I think we need to learn from mistakes, and we should be unafraid of experimentation” (int. 113). Also, participants argued that leadership at higher-level organisations (such as the Federal and State Governments) should incorporate a resilience thinking framework into the policy and planning documents and facilitate its application by delivering financial and technical support.

In addition, participants indicated that having a holistic and inclusive vision in governance arrangements is required for an appropriate resilience capacity. They indicated that this vision should account for long-term and sustainable welfare of the coastal SES that consider a broader range of values and interests. To highlight this feature, interviewee 113 stated that: “there is a lack of expansive thinking; holistic thinking as well. The team that I used to manage in government, we were always a bit of a misfit”.

The interviewees identified collaborative and informed decision-making as another important attribute for enhancing resilience capacity. For example, an interviewee indicated that: “there needs to be partnership about how that occurs, but the final decision needs to be an educated decision, the educated decision could be made by the community and individual. It cannot be only driven by the State” (int. 112). To address a collaborative and democratic governance, many interviewees indicated that the processes of coastal decision-making and policy development should take more account of social and community engagement and bottom-up leadership: “[resilience capacity enhancement] can’t be done in a top-down way. It needs to be bottom-up” (int. 112).

The analysis showed the substantial contribution of enhanced public awareness and education could make to improve resilience capacity of Tasmanian coastal governance. Participants argued that public help and support are critical to direct the influence of public institutions in the process of coastal decision-making, establishing resilience-based coastal governance and improving resilience capacity. For example, interviewee 104 argued:

> a big part of our coastal adaptation project is getting information and informing the members of the community in that area that what we are specifically doing. As the potential impacts of what they need to know and what they can do about it. So, resilience in that term is that you are

> building strength in that community to better deal with that rather than just leaving that to the council.

Interviewees considered that an enhanced knowledge system with valid and current data could be developed, managed and shared across scales. These are essential elements of a resilience-based Tasmanian coastal governance system. Participants indicated that the availability of valid data and information would enhance the capacity of adaptive learning in all levels of governance and facilitate increased informed decision-making and policy development. Also, a broader and more diverse range of professional human expertise could facilitate the process of adaptive learning and informed decision-making, as one participant argued:

> if you are dealing with uncertainty, you want to be able to how lots of people dealing with lots of different issues, and if something happens that you are not expecting there might be somebody there has been thinking about that and may have the answer; but if you are very concern about minimising resources and dealing [with] most likely risks, then you focus on that and forget everything else, so you become a little bit blinkered (int. 116)

6.5.4. **The power and utility of resilience thinking in Tasmanian coastal governance**

Although a number of participants identified complications and drawbacks of incorporating a resilience thinking framework into Tasmanian coastal governance, the results showed the power and utility of this incorporation. In general, it was broadly accepted that resilience thinking framework, according to the definition in this thesis, could address some aspects of coastal governance better than other approaches. For example, the participants mostly agreed that resilience thinking could respond to the complexity of decision-making and policy development for Tasmanian coastal areas. The finding showed that although a risk management approach is capable of addressing some aspects of coastal governance, it fails to provide the holistic and inclusive approach required for system-level policy-making. As interviewee 110 argued: “I agree that risk management has more utility in a low-scale project like coastal management issues and resilience approach could be more appropriate for a higher-scale decision-making and policy development”.

Interviews suggested that a combination of resilience and risk management approaches should be taken into consideration in Tasmanian coastal governance. However, an emphasis

was placed on the priority of resilience thinking before the application of a risk management approach. In this respect, the participant 105 argued:

> I think you have to put them together, and I think the first thing is you focus on the resilience of the system. I can make my personal risk assessment with me functioning on the peak. Because my risks depend on my resilience. If I'm fit and healthy I can jump over the river but if I am overweight, that river becomes a risk to me, and I need a bridge. So, if your organisation is fit and healthy ... that is focusing on the governance is critical.

Furthermore, the results indicated that resilience thinking is a framework that could support an open-ended and flexible type of coastal governance. Therefore, resilience thinking is a suitable framework to deal with the complexity of coastal SESs under conditions of uncertainty. To indicate this utility Interviewee 121 said: "resilience is flexibility and keeping the gates open - keeping the options open to deal with an uncertain future. Holistic in terms of understanding what the scenarios are [and] what the future could hold" (int. 121).

Participants stated that resilience thinking is a proactive approach, so it can support novelty and innovation in leadership and enhance the level of preparedness for uncertain future. In this regard, one participant claimed: "it is the more proactive way rather than risk management approach. You can be in a position to respond in a better way if you take that sort of approach. I am sure if it's explained properly and done properly, it would be a better way to manage those places than trying to have a reactive approach" (int. 117).

The analysis of participants' understandings regarding the power and utility of resilience thinking and risk management revealed some noteworthy findings. The main counterargument for the application of resilience thinking referred to the complexity of its theoretical aspects and implementation in the real world. A number of the interviewees mentioned that with the resilience thinking approach, putting boundaries around the system and defining the unit of analysis would be difficult. Therefore, the application of resilience thinking could be ambiguous when it comes to small-scale management practices. To support this idea, interviewee 111 indicated: "but the problem with resilience thinking and resilience approach is it is hard to put a hard boundary and definitions, for every person building resilience means differently" (int. 111).

On the other hand, some interviewees discussed the problems of implementing a risk management approach in current Tasmanian coastal governance. A participant indicated that the process of risk assessment and management is biased towards human-system interests rather than natural values and argued: risk management approach normally is concerned about the human development [values], not ecological values" (int. 110). In addition, some of the participants claimed that compared with resilience thinking, a risk management approach is command and control, narrow, reactive and defensive. In this regard, interviewee 101 said:

> I think risk management approach will quantify risks and develop strategies about "if it happens, then what?". Scenarios at different intensities. But it is static in a way. It is like sitting in a castle and dealing with outside challenges. The risk is still real, whatever the approach is, even if you take it from resilience approach.

6.6. Chapter Summary

This chapter analysed participants' opinions on: identifying influential coastal governance levels and organisations; major problems and opportunities influencing the Tasmanian coastal zone; the level of resilience capacity (both adaptation and transformation) in the current Tasmanian coastal governance regime; barriers, opportunities and requirements for enhancing resilience capacity; and interpretations of a resilience framework and its power and utility in delivering responsive coastal decision-making and policy development.

The findings showed that the Tasmanian Government and local councils are the most influential players in Tasmanian coastal decision-making, policy development, planning and management. Most of the participants interpreted adaptation (and its capacity) as the ability of the governance system to respond to incremental changes (mainly related to climate change impacts). In this respect, adaptation was defined as the ability to maintain existing values and interests. Poor leadership, the inadequacy of supportive regulatory framework and unavailability of financial and human resources were the main barriers to enhance the adaptation capacity of Tasmanian coastal governance.

Transformability was acknowledged as a feature of a resilience-based Tasmanian coastal governance. Although defining transformation capacity was difficult, participants generally considered that transformation is the ability of a system to embrace change and uncertainty

and find new opportunities and progress. Poor leadership approaches, the semantic and conceptual complexity of the concept and the lack of support from the legislative, policy and planning framework were mentioned as major issues in enhancing the transformability of Tasmanian coastal governance.

Opinions on the concept of resilience capacity were diverse. Some respondents interpreted resilience as a notion similar to adaptation capacity. Resilience capacity was interpreted as the ability to maintain the existing condition, the capacity to recover, and bounce back to the previous situation after disturbed. On the other hand, some interviewees defined resilience capacity as the capacity to adapt and transform. Poor leadership, lack of holistic understanding, complexity thinking and conceptual complexity were identified as the major barriers to enhancing resilience capacity. The need for leadership for change, political support and adaptive learning, availability of human expertise and financial resources were identified as essential factors for improving system transformability.

Finally, the participants generally agreed on the power and the utility of adopting resilience thinking for system-level decision-making and policy development. In addition, a combination of risk assessment and resilience thinking approaches was proposed for robust coastal governance across the entire coastal governance panarchy. In this regard, the findings suggest that resilience thinking is a more appropriate framework to deal with large-scale and complex problems whereas risk management is more suitable for addressing small-scale coastal management issues.

Chapter 7. **Discussion**

This chapter aims to highlight the key findings of the research and further discuss the results of the study. In this regard, it will

1. Discuss key findings from the results presented in Chapters 5 and 6 structured according to the attributes that constitute the resilience capacity of the case study coastal governance. Each element is considered regarding the strengths and weaknesses of Tasmanian coastal governance.
2. Examine participants' interpretations of resilience concepts, resilience thinking framework, and the implications for the Tasmanian coastal governance system.
3. Draw on the literature review and case study findings to reflect on the power and utility of resilience thinking for informing the design of resilience-based coastal governance arrangement.
4. Suggest potentially useful reform options that are likely to enhance the resilience capacity of the case study governance systems.
5. Reflect on the descriptive and analytical value of the attributes established in Chapter 3.
6. Draw out implications for the design of resilience-based coastal governance regimes beyond the case study area.

7.1. Findings on resilience capacity in Tasmanian coastal governance

One of the objectives of this thesis was to evaluate Tasmanian coastal governance resilience capacity. However, rather than being merely critical of the current regime, the study adopted a futuristic and reformist approach to suggest a desirable structure and the potential reform options based on existing weaknesses and opportunities. In this section, the results of the study on the influential organisations, attribute importance and their performance regime will be discussed. Finally, the section identifies potential issues that influenced participants' understandings and evaluations.

According to the findings of Chapter 5, all the 16 attributes were identified to have a degree of importance in developing a resilience-based Tasmanian coastal governance. The survey result showed that 14 attributes were in the important or highly important categories. Only two attributes, including distribution of power between Australian Government-NRM and

Tasmanian Government-NRM, were in the moderately important category. However, the relative importance value (mean value) of each attribute varied slightly according to organisational influence, their roles and responsibilities, and their position in the coastal governance panarchy.

For example, while organisational learning was in the highly important category at all the levels of governance, leadership for change attained a slightly higher importance value at the State and Federal levels than for the local level. The quality of knowledge acquisition, management and sharing mechanisms were highly important at Tasmanian State level. However, these attributes acquired a slightly lower importance value on a local scale. In addition, conflict resolution mechanisms were somewhat more relevant at for local level organisations than for other levels. The results of this evaluation provided a valuable platform for proposing effective reform options based on the regime of attributes and the particular requirements to enhance them at each organisation (Section 7.4).

Also, the analysis in Chapter 5 showed that the state and local level organisations had the most number of highly important attributes. These attributes included supportive legislation, leadership for change, organisational learning, diversity of expertise, knowledge acquisition, management and sharing processes, transparent decision-making processes, leadership for securing outcomes, adaptive planning and management cycle, and stakeholder engagement processes for the State Government. Organisational learning, adaptive planning and management cycle, transparent decision-making processes, stakeholder engagement processes, and conflict resolution mechanisms were highly important attributes at a local government level.

The findings of Chapter 6 confirmed the survey results on the significant influence of the State and local level governments in Tasmanian coastal decision-making and policy development process. Nevertheless, the area and the mechanisms of organisational influence varied across governance levels. For example, while the Australian Government was more influential through providing financial and technical assistance, the State Government had more statutory accountability, and local councils were more influential through their coastal planning and management responsibilities.

Furthermore, performance against the attributes varied across organisations. The results indicated an overall higher resilience capacity at regional and local levels. Almost 75 per cent of the attributes regimes at Clarence and Kingborough Councils showed a degree of contribution to organisational resilience capacity. However, Huon Valley Council showed a lower performing regime and consequently less resilience capacity against these attributes. According to the interview analysis, the lower resilience capacity at Huon Valley Council could be due to a lack of financial resources, inadequate human expertise, lower public awareness and lower level of leadership for change.

One of the major reasons for low resilience capacity at Huon Valley is the lower priority of environmental and natural resource management issues in the council area. As a local participant argued, due to the inadequacy of financial and human resources, responding to environmental and coastal problem attracts less attention compared with economic and social problems, such as infrastructure development, unemployment and public health issues. Based on the interview analysis, it is likely that an enhanced public awareness of the consequences of environmental drivers and their influence on the quality of coastal SES could reframe Huon Valley Council priorities.

As the findings in Chapter 5 showed, the highest attribute performance in Tasmanian coastal governance was evident in the leadership for change at Clarence Council (mean value= 3.1). The strong leadership had a significant influence on improving the Council's resilience capacity. However, it is likely that the high importance and low performance of leadership at the Federal and State levels compromise the capacity of strong leadership at a local scale and adversely affect resilience capacity of the entire governance system. Thus, enhancing leadership capacity at Federal and State level organisations (and its synergic impacts on local level capacity) are considered in the reform options presented in Section 7.4.

Moreover, the findings of the Chapters 3 and 6 suggested a synergic interaction between some attributes, whereby the attributes tend to reinforce each other in improving organisational resilience capacity. For example, leadership-related issues (such as political will and support) were frequently identified as essential requirements for developing a resilience-based coastal governance. Some participants pointed out the well-developed

leadership for change at Clarence Council and its influence to enhance the regime of other attributes such as stakeholder awareness and engagement, problem-solving capacity, transparent decision-making mechanism, and developing a quality knowledge system. Accordingly, a regime with well-developed capacities in relation to these attributes would empower the leadership to make effective adaptational and transformational decisions.

Despite the significant influence of the State Government agencies on coastal governance, these institutions perform poorly in relation to attributes that confer resilience capacity. DPAC and TPC failed to contribute to any level of resilience capacity for all 16 attributes. Despite the statutory role of DPAC in coastal policy development, the associated attributes were in the pre-resilience mode.[12] So, the need to improve DPAC capacity particularly in regard to the attributes related to legislative framework development and leadership was considered in proposing the reform options (Section 7.4).

The unsupportive performance of the TPC, as the Tasmanian peak planning body, also indicated a potentially defective state planning system. For example, adaptive planning and management cycle, conflict resolution mechanisms, stakeholder engagement process and organisational flexibility were in the no-resilience mode. The lack of resilience capacity at TPC indicates weaknesses and incapacity of the Tasmanian planning system regarding adaptive, collaborative, democratic and fair planning procedures.

DPIPWE showed a slightly better performance compared with DPAC and TPC. At this agency, knowledge system attributes and diversity of expertise supported a marginal mode of resilience capacity, and the rest of the attributes were non-supportive. For example, despite the major leadership role of DPIPWE in coastal decision-making and management, the associated attributes were in the pre-resilience mode. In addition, the inadequate flexibility of DPIPWE structure suggested that this agency has a low capacity to respond to future changes and plausible scenarios.

These deficiencies in State-level organisations may be due to: inadequate intersectional and cross-scale collaboration and communication, lack of political will and support, domination of neoliberal paradigm and risk-averse attitude in the state level decision-making system

[12] In this section, the classification system developed in Section 5.3 will be used to address the levels of performance in terms of no-resilience, pre-resilience and resilience modes.

and unsupportive legislative framework. Given the important role of state agencies in relation to many of the attributes, in particular leadership and supportive legislative framework, this is a significant capacity deficit – addressing this issue will be a priority in the reform options proposed in Section 7.4

Based on the 16 attributes, the findings of the study showed a general incapacity of the current Tasmanian coastal governance system for the development of resilience-based coastal arrangements. In more than half of the situations, the attribute regimes were not delivering a supportive mode of resilience capacity, 25 per cent were moderately supportive, and only 20 per cent were adequately supportive. In general, the attribute regimes were particularly poor in relation to adaptive planning and management cycle, leadership for change and securing outcomes, and organisational flexibility.

The absence of an appropriate overarching framework (such as effective state-wide coastal policy), lack of leadership support and political will, and poor organisational communication and collaboration were the major barriers to the development of resilience-based Tasmanian coastal governance. Limited financial and human resources, the complex nature of resilience thinking framework and inappropriate stakeholder awareness and engagement process were also identified as other barriers. Addressing these issues was a key focus of proposing the reform options given in Section 7.4

A governance regime with a low level of legal and political support, lack of clarity in the decision-making process, imbalanced power relations and organisational isolation encourages a risk-averse attitude in decision-makers and consequently undermines the capacity for innovation, novelty and entrepreneurship (Kahneman 2011; Sunstein 2005; Taleb 2012). The findings of the research indicated that the existing Tasmanian coastal governance regime is suffering from these problems.

For example, the result of Chapter 5 and 6 identified an unsatisfactory situation in relation to the availability of supportive legislative framework on the State scale. This situation could raise other concerns such as lack of clarity in decision-making processes and uncertainties over the allocation of liability for any problems that arise from planning decisions. Interview participants frequently expressed the view that, due to the lack of clear and overarching

guidelines and directions from the State Government (such as a coherent and functional coastal policy), coastal planning and decision-making is ad-hoc rather than systematic.

Although some attributes were contributing to systems adaptability, they were not supporting transformability of Tasmanian coastal governance. For example, while the quality of knowledge system was moderately supportive of developing adaptation responses, some participants claimed that there was insufficient knowledge base to support transformational decision-making. As a result, developing a suitable form of capacity that supports both adaptability and transformability of Tasmanian coastal governance was identified as a principal consideration in developing the Section 7.4 reform options.

Potential sources of inconsistency and confusion in the results

An analysis of the results of Chapter 5 and 6, revealed some inconsistencies and confusions in participants' interpretations and evaluations. Participants' opinions appeared to be influenced by a variety of factors, including the scale of their concerns (from local to national), personal interests (such as protecting their jobs or personal properties), value systems (such as participants' viewpoints in relation to conventional economic, social and environmental concerns/approaches), the roles and responsibilities of participants affiliated organisations and the focus of their professional roles and fields of expertise; and participants knowledge and understanding of concepts such as coastal governance, complex adaptive SESs, resilience thinking, adaptability and transformability.

For example, comparing participants from state-level agencies with those from local government, the former had a broader understanding of Tasmanian coastal SES issues, recognised that they were confronted with greater degrees of complexity and uncertainty, and were more likely to be influenced by state-scale political concerns. On the other hand, local government respondents generally had more limited or sectoral concerns, were confronted with less complexity and uncertainty, had greater demand for prescriptive guidelines and clear direction, were more concerned about legal liabilities associated with their planning and management decisions, and expressed greater concern to about local community interests.

Organisational roles, responsibilities and fields of expertise also appeared to influence participant's views. For example, respondents at operational organisations were essentially

concerned about the applicability of the resilience thinking framework and implementation of resilience-based governance in the real world. Conversely, and not surprisingly, the theoretical and conceptual foundations of resilience thinking framework were amongst the important concerns for researchers and academics. Also, while some respondents, (for example, from DPIPWE) were more focused on environmental conservation and natural resources management strategies, DPAC and TPC participants were more concerned about human development and protecting socio-economic values.

Finally, there were divergent views amongst participants regarding inter-organisational communication and knowledge management systems. For example, while some local government participants identified unavailability of data and information as a weakness, respondents from State and Australian Governments saw it differently. This may indicate insufficient inter-organisational and cross-level flows of data and information, deficiencies in knowledge sharing mechanisms, and lack of effective organisational collaboration and communication.

7.2. Interpretations of resilience and resilience thinking

The understandings and interpretations of resilience concepts and the resilience thinking framework (both in the literature and for case study participants) were diverse, inconsistent and confused. Three main types of interpretations of resilience were evident: (i) resilience as a property or a feature of a system (particularly prominent in engineering which concentrates on artificial and predictable systems, and ecological science which focusses on natural stochastic systems); (ii) as a particular capacity or ability to create an outcome, particularly dominated by the influence of human and social subsystems; and (iii) as an overarching frame of mind and a higher order of thinking about complex adaptive SES (which is defined as resilience thinking).

The first interpretation (resilience as a property of a system) refers to the ability of a system (mainly ecological systems) to persist and adapt to incremental changes, and return to its pre-disturbed condition (Holling 1973a, 1996a). This form of resilience is in principle measurable, although some scholars argue that in practice it is hard to measure and depends on the systems characteristics and stability landscapes (Carpenter et al. 2001; Carpenter et al. 2005; Gunderson 2000). This interpretation of resilience, which was the

most frequently expressed by case study participants, is reactive and its responsiveness to a diverse range of drivers is limited. Strategies to support such resilience tend to be specific responses to particular drivers of change, and so may be ineffective with respect to other drivers (Adger 2006).

The second understanding of resilience is commonly adopted in the climate change adaptation, urban planning and disaster management literature, and was also evident in responses of some interview participants. It encompasses a proactive form of system capacity that is primarily created by human and social drivers (Walker et al. 2004). According to this interpretation, the outcome of management actions is to reduce system vulnerability and create resilient systems. As observed by an interviewee: "I was considering resilience as an outcome [of management actions]. This is the first time that I have thought about that as an approach. It could be used in that context [approach] as well".

The third interpretation (which is the focus of this thesis) concentrates on "resilience thinking" as an overarching framework, and a higher order of manner of understanding SES complexity and dynamics (Benson & Craig 2014; Fazey 2010; Folke et al. 2010). Resilience thinking as a framework encompasses a set of embedded concepts and approaches associated with SES, adaptive cycle, panarchy, adaptability and transformability. Rather than focusing on the outcomes, the resilience thinking framework emphasises capacities, rationales, mechanisms and processes that enable, in this case study, a coastal governance system to make adaptational and transformational decisions. Although most of the case study participants primarily offered the first two definitions, most of them broadly accepted the utility and application of the resilience thinking framework when this interpretation was further discussed in the course of the interviews.

Inconsistencies in the definitions and applications of resilience, both in scholarship and in the views expressed by the case study participants, were due to confusion between these three interpretations. The findings in Chapters 5 and 6 revealed three potential sources of confusion: conceptual complexity and interpretive nature of the resilience thinking framework; diverse fields of application; and superficial or careless application of the concept in the literature.

Conceptual complexity and interpretive definitions: Resilience thinking and its associated concepts such as adaptive cycle, panarchy and transformation are complex in nature. Resilience thinking framework is an amalgamation of different (and sometimes conflicting) epistemological, philosophical, social and scientific ideas. Walker and Salt (2006, p. 8) claimed that resilience thinking is "part philosophy, part pragmatism". Fazey (2010) argues that an appropriate understanding of resilience thinking requires an epistemological shift in constructing our knowledge and a fundamental change in understanding the nature and the function of complex adaptive systems. He claims that this fundamental shift is challenging, necessitates a "higher order of thinking" and involves a new type of rationality.

Scholars address the multifaceted and multidimensional nature of resilience thinking and claim that due to this complexity, providing a clear and conforming understanding of resilience thinking is difficult. As discussed in Chapter 3, the analysis showed that definitions of resilience thinking and its underpinnings, especially in a social science context, have been subjected to different interpretations in the evolutionary development of the framework (Davoudi et al. 2012; Walker & Salt 2012). The interview analysis confirmed inconsistencies in the interpretations of resilience thinking due to its conceptual complexity. As one participant indicated "the concept of resilience is very complex and therefore difficult to understand and define, and building resilience could, therefore, mean different things to different people".

Diverse fields of application: Since its emergence, the resilience framework has been applied in several fields of studies and for various purposes. As a result, understanding of resilience thinking was largely influenced by the characteristics and the requirements of the domain of the application. For example, a common interpretation in disaster management, explains resilience as a concept opposite to vulnerability. The major focus of resilience-based disaster "management" is on recovering a disturbed system to its pre-disturbance situation (Boin et al. 2010). So, it is likely that a researchers or practitioner, with an experience in disaster management, duplicates (or expands) this understanding in other domains of research and implementation.

The interview analysis suggested a possible relation between participants' professional experience (and knowledge) and their definitions of resilience. For example, interviewees involved in climate change adaptation (such as int. 123 and 105) provided explanations of resilience that mainly focused on the notions of adaptation capacity and adaptability. On the other hand, a participant who was involved with geomorphological studies (int.102) defined resilience as robustness and resistance of physical systems to adversity such as coastal erosion and inundation.

Superficial or careless application of resilience framework in the scholarship: According to the results of Chapter 3, resilience-related concepts in the literature were repeatedly misused or misinterpreted. Due to conceptual complexity and diversity of implementation contexts, application of the framework and its associated concepts, without an in-depth scrutiny of the original definitions and compatibility of the interpretations with the application context, could further compound the confusion. The researcher perceived that due to the popularity of resilience framework, some researchers tend to rush to adopt and apply resilience thinking (and related concepts) in the literature without the required careful attention to the meanings and interpretations of key terms and ideas.

For example, Hodgson et al. (2015, p. 503) note that "Holling's classic exposition defined resilience to be the ability of a system to resist change in the face of disturbance". However, Holling (1973a) introduced the concept of ecological resilience to highlights systems persistence to change" rather than resistance.[13] In this regard, Holling describes resilience as "measure of the persistence of [ecological] systems and of their ability to absorb change" (Holling 1973a, p. 14). This misunderstanding and inaccurate use of the concept in the literature was pointed out by other scholars (Brand 2009; Walker & Salt 2012).

Moreover, Taleb (2012) disputes the capacity of the resilience framework to guide progressive and entrepreneurial systems. Despite Taleb's valuable insights and contributions in developing the idea of "antifragile" systems, his view was founded on a misperception of the resilience thinking framework, and in particular his failure to recognise that the concept of transformation has for some time been embedded in resilience thinking. In this regard, since 2006, resilience scholars have been emphasising the notions of progress,

[13]- As they are presented in the stability literature.

development, and transformation in resilience thinking (Folke et al. 2010; Walker et al. 2004; Walker & Salt 2006).

Finally, the analysis in Section 6 revealed a lack of clarity and confusion around applications of resilience in the institutional documents (such as organisational policies and plans). Some participants argued that these flawed applications are a barrier to incorporation of the resilience framework into governance contexts. Without semantic and terminological clarification, strategies to develop a resilience-based coastal governance and enhancing resilience capacity remains ad-hoc and inconsistent.

Due to inconsistencies in defining the concept of resilience and the resilience thinking framework, identifying the features of resilience capacity and the requirements for improvement were challenging. In the early stages of the interviews, many interviewees defined resilience capacity as the capacity to adapt. According to this definition, an adaptable system is resilient (Smit & Wandel 2006). This interpretation disregards the potential for regime shifts, fundamental change and system transformability.

With the recognition of increasing influence of rapid drivers and the potential for fundamental change leading to regime shifts, the idea of transformability was acknowledged by Folke et al. (2010) and Walker and Salt (2006) for example, as a requisite feature of resilience capacity. Therefore, transformation capacity was included in the requirements for a resilience-based (or adaptive) governance arrangement (Folke et al. 2010; Walker et al. 2004). Despite their initial understandings of resilience, in the case study participants mainly referred to system adaptability; but following the discussion about the potential transformational drivers that could affect the Tasmanian coastal SES, interviewees recognised transformation capacity as an essential feature of resilience capacity.

Like adaptability, transformability of a system could be reactive or proactive (Kates et al. 2012). The findings showed that a considerable number of the participants defined transformability as a reactive concept. Some interviewees described transformation capacity as systems recoverability or the ability to develop emergency responses. In this regard, the emphasis was on the idea of returning a system to its pre-disturbed situation (bouncing back). Also, some of the interviewees understood transformation as a part of the

adaptation process. This interpretation echoed the concept of transformational adaptation as described by Kates et al. (2012).

Regarding the attributes, participants identified almost similar requirements for system adaptability and transformability. This similarity could be explained by two distinct scenarios. One scenario confirms the results of the literature review on the robust interrelations between resilience, adaptability and transformability and strategies for their improvements (Folke et al. 2010). This scenario suggests that the same attributes that contribute to systems adaptability are also involved with transformation capacity. Thus, in developing strategies to increase system adaptability and transformability, the focus should be placed on enhancing performance regime of the same type of attributes in the governance system.

Some findings of the interview analysis supported the assumptions of this scenario. For example, while the requirements for leadership-related attributes were highly emphasised for improving both transformation and adaptation capacities, some indicated that enhancing systems transformability requires a higher degree of leadership (especially leadership for change). In addition, some responses identified that for making a transformational decision, the quantity and quality of data, information, and knowledge should be higher.

The second scenario takes into account the confusion in the interpretations of resilience, where the participants mostly excluded transformability in defining resilience capacity. The analysis showed that transformation capacity was not well acknowledged in the current Tasmanian coastal governance; therefore, the underpinnings and requirement of transformability are unknown and unclear. This scenario assumes that some participants expanded the features of adaptability to conceptualise systems transformability. This issue highlights the necessity for further investigations to study the convergences and divergences between adaptability and transformability and their implications in Tasmanian coastal governance – a need that will be addressed in Chapter 8.

7.3. The power and utility of resilience thinking for informing governance practice

The findings of the research demonstrated the suitability of the resilience thinking framework to address the complexity of coastal SES and the dynamics of environmental and social drivers of change. In addition, resilience thinking, with the embedded ideas of non-linearity, multiple stability domains and panarchy, addresses fundamental qualitative aspects required for a good governance arrangement. A coastal governance arrangement, based on the resilience thinking framework, is forward-looking and support a fair and balanced consideration of coastal SES value and interests.

According to the findings of Chapters 3 and 6, a resilience-based coastal governance is futuristic and forward-looking rather than orthodox and conformist; holistic and inclusive rather than partial and comprehensive; collaborative and communicative rather than competitive and fragmented; flexible and innovative rather than rigid and prescriptive, complex and dynamic rather than simplistic and static; panarchial and polycentric rather than hierarchical and centralised; and proactive and entrepreneurial rather than reactive and risk-averse (Davoudi 2016; Fazey 2010; Folke et al. 2010; Walker & Salt 2012; Walker & Salt 2006). These features and characteristics of resilience-based coastal governance according to the findings of the study are discussed below.

It is futuristic and forward-looking: According to the Berkes (2007, p. 283) resilience thinking is "forward-looking and helps to develop policy options for dealing with uncertainty and future change". The conventional environmental management approaches have a negative viewpoint about change and uncertainty, and a particular focus on risks and hazards. In contrast, the resilience thinking framework embraces change and uncertainty and focuses on finding the windows of opportunities for future development. According to the results in Chapters 3 and 6, a resilience-based Tasmanian coastal governance arrangement with appropriate transformation capacity is forward-looking and enhances the level of novelty and innovation.

It is entrepreneurial and innovative: As Eburn and Dovers (2013, p. 2) argued, under the existing risk-averse and neoliberal governance paradigms, "the focus of governments and individuals has shifted from creating social goods to avoiding social bads". The findings of

Chapter 6 showed that due the existing risk-averse approaches and domination of short-term economic-based attitude, the Tasmanian political climate had become unnecessarily risk-averse. Resilience thinking framework encourages a fashion of leadership that understands potential risks and adversities but through innovation is capable of embracing change and uncertainty. This form of leadership does not advocate that "doing nothing is the best option" (as some participants stated) and is prepared to facilitate a regime shift if required.

It appreciates system complexity and diversity: The complexity of the underpinnings of the resilience thinking framework raised concerns about associated understandings and implementation, both in the literature and amongst case study participants. These concerns include the challenge of implementing the complex framework in coastal governance and its practicability to address real-world problems. Some interviewees indicated that due to such complexity, defining a unit of analysis (for example, putting boundaries around the system) and identifying potential risks and opportunities would be difficult.

Most of these critiques were shaped according to the interpretation that defines resilience as a property of a system (as described in Section 7.2). According to the definitions used in this research, the resilience thinking framework is designed to deal with SES complexity (Duit et al. (2010). The findings discussed in Section 7.1 indicate an inadequate capacity in the existing Tasmanian governance arrangements to deal with the complexity of coastal SESs. The conventional approaches mainly focus on simplification of complexity rather than embracing it (Holling 1996c). Hence, the capacity of resilience thinking framework to deal with the complexity of decision-making for coastal SES is a useful and desirable feature rather than problematic.

It is inclusive: Although resilience thinking is the main frame of mind in resilience-based coastal governance, it encourages the inclusion of a hybrid regime of approaches and frameworks. For example, the risk management approach, EBM and precautionary principle could be utilised as complementary approaches to deal with coastal management issues at local or regional levels. The results in Chapter 6 identified that the case study participants agreed on the utility of a combination of resilience thinking and risk management across the scales of Tasmanian coastal governance. Several respondents indicated that application of

risk management approach, for example, at a local level provides knowledge feedback to improve resilience capacity of the entire system.

It is holistic: The findings showed that resilience thinking is an appropriate framework to deal with the complexity and dynamics of coastal SES holistically. As (Holling 1996a, p. 734) argues, resilience thinking belongs to a stream of science that is not "reductionist and certain" but "integrative and uncertain". So, in dealing with complex coastal SES, instead of simplifying the complexity and splitting the system into its smaller elements, resilience thinking embrace the complexity and analyses the complex system as a whole entity (Holling 2001).

The finding of Chapter 6 confirmed that resilience thinking could deliver a holistic framework to deal with Tasmanian coastal SES as well as environmental and social drivers of change. The participants identified that lack of a holistic approach that can go beyond the conventional sectoral, partial, reductionist and fragmented attitude, is an essential weakness of Tasmanian coastal governance arrangements. As a result, incorporating the resilience thinking framework into coastal governance would assist with holistic analysis of stakeholders' interests and values and integrative decision-making systems.

It is panarchial: As argued in Chapter 3, panarchy and adaptive cycle are two essential features of the resilience thinking framework (Walker et al. 2004). The adaptive cycle emphasises that system development is an ongoing process of creative destruction (Holling 1973a; Walker et al. 2004). According to the idea of panarchy, each focal system is in constant and synergic relation with other systems across scales. So, the flow of information and instructions are neither top-down nor bottom-up; they are panarchial.

Incorporating the concepts of panarchy and the adaptive cycle can improve governance arrangements and function. For example, through panarchy, the process of clarifying and defining organisational roles and responsibilities according to their influence would be facilitated. Other benefits of this incorporation include: enhancing intersectional and cross-level communications and collaborations; responding to scale mismatch problems in coastal decision-making and policy development; and developing appropriate mechanisms for evaluating and monitoring the effectiveness of responses.

Panarchy and the adaptive cycle highlight that enhancing resilience capacity of a governance system is a shared responsibility between different organisations across levels. Improving resilience capacity at any particular organisation (and at any governance level/layer) enhances resilience capacity of the entire system. For example, allowing release phase (Ω) occur at a local level can lead to growth (r) in the whole system. So, allowing for smaller decision-making mistakes at local scale would accumulate knowledge and increase institutional learning. This approach can avoid larger mistakes at higher-level, which can have irreversible and severer impacts on the entire system.

7.4. Reform options for resilience-based Tasmanian coastal governance

The procedure for developing the capacity to improve resilience-based Tasmanian coastal governance is not a matter of 'one size fits all', but should involve multi-scalar capacity building that considers present opportunities and accounts for future requirements. The reform options outlined in this subsection were developed to address the main requirements for developing a resilience-based Tasmanian coastal governance arrangement, as supported by the findings in Chapters 3 to 6. The reform options are structured according to the following themes.

Framework, approaches and arrangements in coastal governance: As argued in Section 7.2, there is a significant confusion in the definition and application of resilience thinking due to the conceptual complexity and semantic lack of clarity in the research and implementation domains. Without clarifying the features of the framework, such as adaptability, transformability and panarchy, achieving a common understanding of resilience-based governance and ways of improving resilience capacity is unlikely. Therefore, the first step in developing resilience-based Tasmanian coastal governance is to respond to the conceptual and semantic problems.

Intersectional communication and collaboration, panarchy and adaptive cycle: Developing resilience-based Tasmanian coastal governance is a shared responsibility between organisations across sectors and scales. A resilience-based arrangement allows for a degree of organisational autonomy while establishing robust connections within and between organisations at all the governance level. Such a panarchical system recognises that the

outcomes of the adaptive cycle at each level influence other levels decision-making processes. For example, the results in Chapters 6 revealed significant confusion about organisational roles and responsibilities in Tasmanian coastal governance. Consequently, a clarification of organisational roles and responsibilities according to their position in the panarchy, the level of their influence and the scale of the coastal problem was a priority in the reform proposal.

Moreover, as the findings revealed, the existing Tasmanian governance arrangements are fragmented and disconnected. So, enhancing the level of organisational collaboration and communication through establishing partnered plans and programs is proposed. For example, establishing a bridging panel that includes representatives of influential organisations, including resource interests such as fisheries, agriculture and community groups could facilitate a process of transparent and collaborative governance.

Incremental, constructive, and reformist development: The process of developing resilience-based governance is a slow and incremental (Garmestani & Benson 2013; van Bueren & ten Heuvelhof 2005). As the results of Chapters 3 and 6 showed, developing hurried responses to increasing economic efficiency, achieve short-term objectives, and foster political popularity are key barriers to enhancing resilience capacity. A resilience-based coastal governance should consider aims and strategies directed towards long-term achievements and collective benefits. Therefore, the strategies for resilience capacity enhancement may scarify some short-term benefits for greater long-term achievements. As a result, the proposal emphasises the importance of strategic planning outside of the short-term political cycles and narrow government interests.

Furthermore, resilience improvement processes are realistic rather than idealistic. As Benson and Craig (2014, p. 780) argue, resilience capacity enhancement processes should avoid "becoming—like sustainability—a rhetorical device with little influence on actual decision making". Resilience enhancement procedure should be reformist rather than revolutionist. The results in Chapter 6 showed that the current Australian governance system is trapped into a political competitiveness loop. Because of this political competitiveness and lack of commitment to long-term strategic planning and policy development, each newly elected political party attempts to make its own mark and rather

than build on achievements made during the previous cycle. In this respect, the reform option considers the idea of "scaffolding" (Ansell 2011; Clement et al. 2016) and implements recommendations that build on the potentials of existing capabilities.

Informed leadership and proactive leadership support: The process of resilience capacity improvement is not deterministic and prescriptive. Strategies to strengthen resilience capacity should allow for novelty and innovation. The analysis in Chapters 3 and 6 emphasised the importance of a proactive entrepreneurial leadership to develop resilience-based coastal governance. As was manifest in participants opinions (especially at a local scale), a risk-averse leadership reactively expects the flow of resource and information from other levels. However, an entrepreneurial leadership can find or create mechanisms to proactively enhance availability and accessibility of resources.

Some respondents argued that stronger bottom-up leadership from community and NGOs would increase entrepreneurial attitudes. Kirk and Shutte (2004) argued that bottom-up leadership from community groups requires capacity building, power-sharing and polycentric governance. In this regards, three elements for enhancing bottom-up leadership were proposed including: (i) "leading change through dialogue", (ii) "collective empowerment", and (iii) "connective leadership" (Kirk & Shutte 2004).

In this respect, the findings indicated that the proactive leadership at Clearance Council provided a good understanding of the situations and potential resources that enabled the Council to bypass the State level bureaucracy and directly link itself to the Federal funding resources. For example, to respond to the coastal hazards, the leadership at the Council attained the financial support from the Commonwealth Department of Climate Change Climate Change and developed the Impacts on Clarence Coastal Areas project. So, it is perceived that improving leadership capacity in each organisation is the first step in enhancing its adaptability and transformability.

Knowledge system and adaptive learning: Attributes related to knowledge systems (including knowledge acquisition, management, and sharing mechanisms) and providing resources (including financial and human resources) to support research and implementation activities are amongst the main foci of the reform options. The results of the study showed that, despite the low direct influence of the Federal Government, this

level could significantly contribute to the development of resilience-based Tasmanian coastal governance through providing resources.

Adaptive learning was another important attribute in the process of forming a resilience-based governance arrangement. As Ostrom et al. (1999) argue, the domination of rapid and radical drivers of changes makes the traditional way of learning (which is learning from past experiences) more difficult. So, adaptive learning should emphasise on enhancing the capacity to accommodate novelty and uncertainty in the decision-making process, rather than exclusive reliance on the accumulation of information and knowledge from the past experiences. This form of learning requires encouraging transformational decisions, particularly at lower levels of governance.

Public awareness and engagement mechanisms: Public institutions, including community groups and NGOs, are important pillars of a resilience-based coastal governance system. As the findings showed, the existing Tasmanian coastal governance does not adequately facilitate public participation and engagement in coastal decision-making and policy development. The reform options address this issue in two different ways: facilitating public participation (reactive), and encouraging public engagement (proactive). In this regard, not only reactive public participation should be facilitated, but also public institutions proactively should be encouraged to engage in coastal decision-making.

Table 7.1 gives details of proposed reform option. It should be noted that according to the scale of the examinations and evaluation in this research, the reform option provides overall and large-scale recommendations that guide the general procedure of developing resilience-based governance. As will be proposed in Chapter 8, detailed and in-depth reform options should be further developed to consider the particular capacity and requirements of each governance level/organisation in accordance with Tasmanian coastal panarchy.

Table 7.1. Proposed reform options for developing resilience-based coastal governance in Tasmania

Reform theme	Key reform options	Governance level/sphere to initiate the proposed reforms				
		Local	Regional	State	National	Other
Framework, approaches and arrangements in coastal governance	Government policies, strategies and plans that direct government coastal actions should incorporate resilience thinking and associated concepts. Government policies, guiding strategies and plans directed to regional and local authorities' actions in relation to coastal areas should require or guide these authorities to incorporate resilience thinking and associated concepts into their coastal decision-making processes. In so doing, policies, strategies and plans should include a clear, unambiguous and consistent use of resilience terms and concepts. At a Federal level, DEE is the main organisation that could lead this effort. At a Tasmanian State level, DPAC could initiate the incorporation of the resilience thinking framework into the TSCP. In addition, DPIPWE, in collaboration with DPAC and TPC, should develop practical mechanisms to apply resilience thinking in the planning and management of Tasmanian coastal areas. The outcome of this process should be presented as a State-scale guidance that would inform the decision-making and action at regional and local levels.	Subordinate	Subordinate	Substantial	Substantial	N/A
	The Federal and Tasmanian Governments should support conceptual and applied resilience-related research, including pilot studies of 'resilience in action' that serve to demonstrate the value of the approach and provide a basis for adaptive learning and a progressive research agenda.	Subordinate	Subordinate	Substantial	Substantial	Subordinate (Academia)
	Policy makers, planner and managers with expertise in resilience thinking should be recruited into key Federal and Tasmanian Government agencies. Alternatively, such expertise could be developed amongst current planning and policy staff. In particular, expertise is needed in evaluating and monitoring resilience-related attributes, developing resilience capacity strategies, and considering panarchial relationships with other sectors/levels.	Intermediate	Intermediate	Substantial	Substantial	Subordinate (Academia)
	A new approach to risk assessment/management under the resilience thinking framework is needed to inform resilience-based decision-making, policy development, and planning.	Substantial	Substantial	Substantial	Intermediate	Subordinate

Reform theme	Key reform options	Governance level/sphere to initiate the proposed reforms				
		Local	Regional	State	National	Other
	Organisations at all levels should adopt approaches/methods/tools to implement the resilience thinking framework. For example, scenario planning is recommended to project future scenarios, enhance preparedness for plausible uncertainties and improve organisational transformation capacity.	Substantial	Substantial	Substantial	Substantial	N/A
Intersectional communication and collaboration, panarchy and adaptive cycle	Panarchial relations and organisational roles and responsibilities in Tasmanian coastal governance should be clarified. This clarification should take account the connections and relations between the scale of organisational influence, organisational roles and responsibilities and synergic interactions between organisations that would provide a coherent response to the complexity of coastal decision-making in Tasmanian coastal governance panarchy. DPIPWE, in collaboration with other State Government agencies, independent institutions, regional NRMs, local councils, universities, community groups and private sectors should identify existing and potential drivers of change that influence Tasmanian coastal SESs. This identification should account for strengths, weaknesses, opportunities, and threats in both natural and human subsystems. In addition, these drivers should be categorised according to their incremental and transformational influence on natural and human sub-systems. Organisational roles and responsibilities should be matched against the drivers of change, and responsible organisations should be identified. Then, the organisational capacity to deliver effective responses to the drivers should be evaluated. This process requires a detailed and in-depth investigation of organisational capacities. The results of this investigation should be compared with the requirements for resilience capacity (adaptational and transformational), and strategies to address organisational deficiencies should be developed.	Intermediate	Intermediate	Substantial	Subordinate	Subordinate (Academia, private sector, NGOs)
	Bi/multi-lateral coastal plans and program should be developed between organisations across scales to enhance the level of multi-level and cross-sectoral partnerships. Priorities should be given to plans and programs between State Government, NRM regions, local councils, academia and NGOs.	Substantial	Substantial	Substantial	Intermediate	Subordinate (academia, NGOs)

Reform theme	Key reform options	Governance level/sphere to initiate the proposed reforms				
		Local	Regional	State	National	Other
	A coastal bridging panel should be established to enables the flow of information and knowledge across levels, and facilitate intersectional and cross-scale communication and collaboration. The panel should include representatives of influential organisations across scales to facilitate collaborative and collective coastal decision-making, policy development, planning and management.	Substantial	Substantial	Substantial	Subordinate	Substantial
	An overarching policy guideline should be developed to facilitate achievement of common understandings about the existing condition of Tasmanian coastal SES and the requirements for improving their health and prosperity. The first step should be the development of a state-wide coastal policy by the DPAC in collaboration with other stakeholders, including NGOs and community groups.	Intermediate	Intermediate	Substantial	Subordinate	Intermediate
	The legislation, policy and planning framework need reform to explicitly identify accountabilities of regional NRM bodies and local councils while allowing a degree of autonomy of these organisations to innovate and adapt. Also, this framework should facilitate community leadership in the process of coastal governance.	N/A	N/A	Substantial	Subordinate	N/A
Incremental, constructive, and reformist development	Developing resilience-based coastal governance arrangements and enhancing the resilience capacity is an incremental, constructive and reformist procedure. So, the procedure should account for long-term dynamics of Tasmanian coastal SES rather than short-term political, economic or sectoral benefits. In this regard, the coastal panel (mentioned above) should develop appropriate visions and goals directed towards the long-term prosperity and well-being of Tasmanian coastal SESs. The panel should seek to minimise the influence of short-term political and narrow sectoral interests on coastal decision-making.	Intermediate	Intermediate	Substantial	Subordinate	Intermediate
Informed leadership and proactive leadership support	Reforms should be made to the current legislative and policy framework where change and uncertainty are acknowledged in Tasmanian coastal areas, and adaptational and transformational decision-making and policy development are appreciated and encouraged at all levels of governance.	Subordinate	Subordinate	Substantial	Subordinate	Subordinate

Reform theme	Key reform options	Governance level/sphere to initiate the proposed reforms				
		Local	Regional	State	National	Other
	Mechanisms should be developed to allow for more bottom-up leadership where the local councils, NGOs and community groups are able to take more leadership and influence the processes of coastal decision-making. Mechanisms to foster bottom-up leadership could include developing mentor programs, communities of practice, short course training, etc. For example, the Federal and State Governments should enhance local council's capacity to take more leadership in coastal decision-making and management. These form of the capacity building could happen through: developing statutory and non-statutory policy and planning framework to acknowledge local councils leadership role in dealing with local decision-making (for example, in regards to climate change impacts on coastal area); providing financial, knowledge and technical requirements to enhance councils informed leadership capacity; delivering clear policies, plans and programs to guide local leaders on their roles and responsibilities to enhance local level resilience capacity; developing regular institutional education programs (such as workshops, seminars and lectures) to update the local councils knowledge-base and enhance their capacity for informed coastal decision-making. State Government should provide resources and support to local councils and NGOs to develop and implement a voluntary and community-based project such as Landcare and Coastcare programs. These projects will increase public knowledge and awareness, encourage their hands on coastal governance and enhances their leadership capacity through engaging them in the adaptive learning and management cycle process. Federal and State Governments, with collaboration with councils and NGOs, should develop regular thematic-based public lectures to inform the community about: the impacts of drivers of change on coastal SES (including the public and private properties), the potential mechanisms that NGOs and community groups could apply their leadership to enhance local level resilience, and the roles and responsibilities of community groups to avoid or minimise the risks. Increasing public awareness and sensitivities (in a way that they could internalise risks and hazards) is likely to increase bottom-up leadership in enhancing the resilience capacity.	Intermediate	Intermediate	Substantial	Intermediate	Intermediate (community groups, NGOs, private sector, academia)

Reform theme	Key reform options	Governance level/sphere to initiate the proposed reforms				
		Local	Regional	State	National	Other
Knowledge system and adaptive learning	Mechanisms should be established to improve institutional education and adaptive learning. These mechanisms should enable accumulation of knowledge and wisdom and creation of institutional memory. The process of adaptive learning is panarchial, and all organisations from various levels are involved. Intersectoral and cross-scale communication and collaboration would improve the capacity for adaptive learning. In such an arrangement, learning should take place in the context of an adaptive planning and management cycle. While the knowledge generated in the policy/planning scale (higher scale) flow down to support decisions at local scales, the outcome of local scale management would inform the process of policy/planning development stage. The Australian Government should develop an integrated national scale knowledge and information system in which valid and current data and information are easily accessible to other organisations, and financially support coastal research and implementation projects at State and local levels.	Substantial	Substantial	Substantial	Substantial	Subordinate

Reform theme	Key reform options	Governance level/sphere to initiate the proposed reforms				
		Local	Regional	State	National	Other
	The Tasmanian Government should: - In collaboration with other state-level stakeholders, conduct detailed studies to identify and analyse the existing and potential drivers that are influencing (or likely to influence) Tasmanian coastal SES. This includes the drivers of threats, risks and opportunities. - Support local councils with an overarching and consistent coastal policy where the major issues of Tasmanian coastal SES are identified and the potential responses are indicated. - Develop institutional education programs to update the local councils' knowledge base and enhance their capacity for informed coastal decision-making. - Provide appropriate finance to local councils and NGOs to develop and implement local scale coastal projects. - Develop capacity for scenario planning in state-level agencies and local councils in dealing with the future uncertainty. Scenario planning is an appropriate tool that could generate knowledge from analysing the potential future situations and enhance the level of preparedness. - Develop state-scale data management and sharing mechanisms accessible to all stakeholders. - Facilitate communications between local coastal councils that share particular problems and potential responses. - Increase the capacity of state-level organisations to access and deploy expertise on climate change, sea level rise, and environmental planning. - Develop a networked learning approach that allows for local level transformational decisions to facilitate adaptive learning at higher levels.	Intermediate	intermediate	Substantial	Subordinate	Intermediate (NGOs, local communities)
	Local governments should develop collaborative arrangements to work with each other on coastal issues and share expertise and capacity for coastal planning and implementation consistent with the resilience thinking framework.	Substantial	Intermediate	Intermediate	Subordinate	N/A
Public awareness and engagement mechanisms	State and local governments and regional NRM bodies should enhance opportunities for genuine, deliberative and ongoing public engagement in coastal decision-making processes: genuine in the sense that community interests have the power to shape decisions; deliberative in that processes provide a forum for information sharing informed decision-making; and ongoing in that processes are continuous and developmental. Genuine and deliberative public engagement would also support the emergence of community-based leadership.	Substantial	Intermediate	Substantial	Subordinate	Intermediate (NGOS, public

7.5. Utility of the attributes for developing resilience-based coastal governance

Some of the attributes, which were deployed in this research to inform the development of a resilience-based governance were more context-dependent than others (for example, supportive legislative framework rather than organisational flexibility). Nevertheless, the researcher perceives that all these attributes could have potential utility to guide the design of developing resilience-based coastal governance regardless of the context in which they are applied. Based on the findings of Chapter 3, 5 and 6, this section examines the potential implications of the 16 attributes in developing a typical resilience-based coastal governance system in a broader context. Also, the section discusses interrelations of the attributes and their synergic contributions in enhancing resilience capacity of a coastal governance system.

7.5.1. Knowledge system

Availability of valid, reliable and current knowledge and the capacity to incorporate it in the decision-making and policy development processes is essential in developing a resilience-based governance arrangement (Berkes 2009). For example, accessibility and sharing available knowledge and information are the key requirements to support informed and evidence-based decision-making. Leadership with good knowledge and understanding of the current situation, future requirements and potential pathways towards a desirable SES condition would increase system capacity to embrace change and uncertainty (Dietz et al. 2003). As a result, any coastal governance arrangement with such a well-developed knowledge system would have a higher level of adaptability and transformability.

Also, an advanced knowledge sharing mechanism can improve intersectional and cross-scale communication and collaboration across the entire governance panarchy (Olsen 2003). Such a knowledge system could influence stakeholder engagement through enhancing the capacity for transparent and evidence-based decision-making that builds stakeholders' trust in the fairness and validity of the decisions. Institutional learning, adaptive planning and management cycle are also influenced because knowledge and information are the basis for learning and adaptive management. Such a knowledge system would improve institutional flexibility through the enhanced capacity for modelling futures and undertaking scenario planning.

7.5.2. **Diversity of expertise**

A diversity of expertise in an organisation could enhance the quality of knowledge systems through improving organisational capacity to acquire knowledge from multiple sources and analyse them according to a diverse range of perspectives. A diversity of organisational expertise would enhance organisational flexibility and improve informed and proactive leadership (due to the ability for multi-disciplinary decision-making). Consequently, institutional learning would increase due to the progressive accumulation of knowledge and information in the system (Armitage et al. 2012).

Also, a diversity of expertise facilitates intersectional and cross-scale communication and collaboration. This attribute could enable achieving a collective understanding of the complexity of a coastal SES, identifying associated problems and indicating potential responses. For example, allocation of a climate change expert responsible for climate change adaptation strategies across a cluster of local governments facing similar issues could create and facilitate collaborative climate change strategies. Furthermore, mobilisation of a diversity of expertise would facilitate panarchial relationships and strengthen system adaptation and transformation capacities. Adaptiveness, deployment of diverse sources and forms of information, flexibility and system dynamic are good governance considerations that could be potentially progressed by effective deployment of diverse fields of expertise.

7.5.3. **Institutional flexibility**

Flexible institutions, with the ability to acknowledge change and uncertainty, are more likely to support a resilience-based governance arrangement (Garmestani & Benson 2013). Flexible organisations are capable of enhancing the quality of organisational knowledge systems from a diversity of sources (Folke et al. 2005). In addition, institutional flexibility is required for adaptive planning and management and institutional learning.

A flexible institution enables incorporation of new knowledge into processes of decision-making and policy development. This enhances capacity for leadership for change and facilitates adaptational and transformational decision-making (Duit et al. 2010; Folke et al. 2005). A flexible institutional arrangement allows mechanisms to be developed that support an appropriate flow of knowledge and collaboration sharing between organisations across

scales. With respect to the resilience thinking framework, flexibility supports capacities related to adaptability, transformability and panarchy (Folke et al. 2005; Mitchell et al. 2015).

7.5.4. **Institutional learning (adaptive learning)**

An enhanced learning capacity improves the process of knowledge acquisition, management and sharing (Lockwood et al. 2010; Pahl-Wostl 2009). Also, learning capacity assists with an accumulation of knowledge in the organisation and increases institutional memory (Allen & Holling 2010; Berkes & Jolly 2002). Therefore, institutional learning raises the ability of human resources and leadership to make informed decisions. By providing a better understanding of the complexity of coastal SESs, institutional learning attributes encourages a more holistic and inclusive leadership mindset (Folke et al. 2005).

The process of adaptive learning strengthens panarchial relationships (Folke et al. 2005). Learning from others' experiences is one of the most common and conventional ways of learning that encourages communication and collaboration between different stakeholders to share the experiences and learnings across levels. Regarding good governance criteria, institutional learning addresses adaptiveness, diversity of information, innovation and novelty, and evaluation and monitoring capacity (Folke et al. 2005; Olsen 2003).

7.5.5. **Leadership (for change and securing outcomes)**

An appropriate leadership for change and securing outcomes influence the regime of almost all the other attributes and increases resilience capacity of the entire coastal governance system. According to the results of Chapter 3, 5 and 6, the role of leadership (especially from higher tiers of governance) in providing support and assistance to develop a quality knowledge system is significant. Also, political leadership, informed by resilience thinking, facilitates the development of policies, guidelines and directions that acknowledge adaptational and transformational decision-making (Olsson et al. 2006). This approach would shift the decision-making system from being short-term and fragmented to an integrated and long-term approach that considers a broader diversity of stakeholders' interests.

Leadership for change and securing outcomes could support a polycentric distribution of power and strengthen panarchial relationships across the governance system (Folke et al.

2005; Mitchell et al. 2015). For example, leadership at state government level could support mechanisms for mutual collaboration and partnerships between national, state and local levels of government. An appropriate leadership could address polycentricity, adaptiveness, innovation and fairness in accordance with good governance criteria (Armitage & Plummer 2010; Folke et al. 2005; Gunderson & Light 2006).

7.5.6. **Transparent decision-making processes**

As the findings of the thesis showed, transparent decision-making increases the level of trust among the stakeholders and encourages their engagement and support in decision-making processes. Also, transparent decision-making exposes stakeholders to the rationales and bases for decision-making thereby facilitating conflict resolution. This fashion of decision-making enhances transformational capacity, for example, by improving mechanisms for evidence-based decision-making (Armitage et al. 2012). Transparent decision-making process could increase levels of communication and collaboration in governance arrangements. Therefore, it strengthens panarchial relationships and resilience capacity. Transparency can support democratic aspects of good governance, including fairness, inclusive decision-making and respect for diverse values (Armitage et al. 2012).

7.5.7. **Stakeholder engagement processes**

The results of the study showed that stakeholder engagement is an essential attribute for improving resilience capacity of a governance system. Stakeholder engagement provides a context where a diversity of stakeholders have their say in the process of coastal decision-making (Armitage et al. 2012). As identified in the interview analysis, genuine and deliberative stakeholder engagement can support fair and transparent decision-making processes through consideration of diverse values and interests. Stakeholder engagement can increase public support and inspire bottom-up leadership, which can encourage and support political leaders to make required adaptational and transformational decisions.

7.5.8. **Intersectional and cross-scale communication and collaboration**

The significant contribution of intersectional and cross-scale communication and collaboration (including institutional cooperation and partnership) to enhance resilience capacity in coastal governance system was indicated in the results of Chapters 3, 5 and 6. As the findings of Chapter 6 showed, robust organisational communication collaboration

enables panarchial relations of multiple adaptive cycles across the levels of governance. Appropriate organisational communication and collaboration facilitates acquisition, accumulation, management and sharing knowledge and experience between decision-makers. For example, interview participants indicated that communication and collaboration between the State Government and local councils could improve the adaptive learning that informs the development of resilience-based governance.

Other attributes that could be influenced by cross-sectoral and cross-scale communication and collaboration include knowledge system, stakeholder engagement, conflict resolution, distribution of power and adaptive planning and management cycle (Armitage et al. 2012; Lebel et al. 2006). For example, as the findings of Chapter 6 indicated, improving knowledge systems and institutional learning can facilitate adaptational and transformational decision-making. These attributes address good governance issues related to democratic aspects, fairness, multi-level governance and polycentricity (Brondizio et al. 2009; Folke 2007).

7.5.9. **Conflict resolution and problem-solving mechanisms**

The significance of conflict resolution and problem-solving mechanisms in improving resilience capacity was evident in the results of Chapter 3. The case study participants confirmed the importance of this attributes in developing resilience-based coastal governance in Tasmania (Chapters 5 and 6). According to the results, appropriate conflict resolution and problem-solving mechanisms improve fairness and transparency of decision-making, which promotes stakeholder trust in coastal governance. Stakeholders trust increases active public engagement and supports effective processes of coastal decision-making and policy development (Folke et al. 2005), which are essential for developing adaptational and transformational responses. In addition, conflict resolution and problem-solving mechanisms address transparency, fairness and democratic aspects of good governance.

7.5.10. **Supportive legislation, policy and planning frameworks**

Design details of supportive legislation, policy and planning frameworks in enhancing resilience capacity of a coastal governance system depend on the particular features and dynamics of the SES to which they are applied. Based on the findings of Chapter 6, in a federal political system like Australia, such frameworks should consider the independence

and connections across all the governance levels. In addition, the frameworks should clarify organisational roles and responsibilities regarding the complexities of coastal SES, the uncertainty of drivers of change (both incremental and rapid) and potential adaptational and transformational decision-making responses.

Supportive legislation, policy and planning frameworks could influence the effective implementation of almost all the other attributes. For example, as most of the interview participants indicated, a state-level coastal policy that accounts for climate change impacts and facilitates the development of adaptation strategies would encourage adaptational decision-making. In addition, supportive legislation, policy and planning frameworks can facilitate processes of informed, evidence-based and systematic decision-making (as opposed to ad-hoc decision-making) (Garmestani & Benson 2013; Mitchell et al. 2015).

7.5.11. **Distribution of power**

The distribution of power throughout a polycentric governance structure is essential in developing resilience-based coastal governance. An appropriate level of distribution of power in the coastal governance arrangements facilitates a polycentric governance arrangement, where organisational roles and responsibilities are balanced. In such a polycentric arrangement every organisation, at any governance level has the degree of accountability to make decisions, and consequently, contribute to the process of enhancing resilience capacity at the entire governance level.

Such an arrangement would deliver appropriate cross-scale communication and collaboration and allow the democratic and fair flow of resources (such as knowledge, information and experience) across the entire governance system (Armitage et al. 2012; Folke et al. 2005). Therefore, the panarchial interrelation of adaptive cycles would strengthen the resilience capacity of the entire system. According to the results in Chapters 5 and 6, polycentric governance enables bottom-up leadership from resource interests, local councils, NGOs and community groups and encourage leadership for change for adaptational and transformational decision-making. However, the design details of polycentric governance will vary with social-political and cultural context.

7.5.12. **Adaptive planning and management cycle**

Regardless of the context, application of an adaptive planning and management cycle in a coastal governance system would enhance the capacity for developing a resilience-based arrangement (Benson & Garmestani 2011b; Gunderson 1999). Implementation of an adaptive planning and management cycle could influence other attributes such as knowledge systems, leadership (for change and securing outcomes), institutional learning and intersectional and cross-scale communication and collaboration (Chaffin et al. 2014; Walker 2005).

For example, adaptive planning and management cycle is defined as "learning by doing". So, the implementation phase of the cycle could create first-hand, valid and current knowledge and information that informs ongoing learning and decision-making processes. As discussed in Chapters 3, 6 and 7, knowledge and information are central to increase the capacity for projecting plausible system trajectories through modelling and scenario planning. Therefore, the knowledge provided through adaptive planning and management cycle could enable the capacity for leadership for change to make adaptational and transformational decisions.

7.6. Implications resilience-based coastal governance beyond the case study area

Although the features of coastal SESs and the characteristics of their stability landscape (Walker et al. 2004) might vary from one geographical place to another, the the nature of coastal problems on a global scale have numerous similarities (Adger et al. 2005; Glaser et al. 2012; Moser et al. 2012). Thus, the proposed resilience-based coastal governance measures for Tasmania, outlined in Section 7.5, could potentially guide the redesign of arrangements elsewhere. Implications of resilience-based coastal governance encompass its application on an international scale (such as coastal conventions, treaties, and agreements), national scale (such as applying the findings of this research to Australian coastal areas), state or provincial level (such as other Australian states or similar jurisdictions worldwide), and catchment or local scales. This section will examine the utility of the proposed arrangements beyond the case study area.

Australia's State of the Environment Report (Australian Government 2011a), indicates that the capacity of Australia's coastal governance to respond to increasing impacts of drivers of

change is not adequate and is decreasing (Australian Government 2011b). Research confirmed the lack of resilience capacity in Australian coastal governance, especially in response to climate change impacts and population growth (Australian Government 2010, 2011b, 2012b). Issues such as poor inter-sectoral and cross-scale communication and collaboration, lack of a holistic approach, insufficient leadership for change, and an unsupportive legislation framework were identified as major reasons for Australia's low resilience capacity in relation to coastal governance and management (Australian Government 2010, 2011b, 2012b).

This research addressed the significant contribution of above-mentioned attributes in enhancing resilience capacity of coastal governance. For example, the inability of the current legislation, policy and planning framework to consider the uncertainty of drivers of change and to support adaptational and transformational decision-making was identified as a significant cause of the low resilience capacity of Australian coastal governance (Australian Government 2011b). According to the proposed reform options, developing and enforcing an overarching policy (such as an updated national-level coastal policy) that accounts for incremental and rapid drivers of change Australia-wide would support resilience-based decision-making for coastal areas. Having national-scale responsive frameworks in place would inform and encourage leadership that is capable of transformational decision-making at all the levels of governance.

In South Australia, for example, a report on the sea level rise problem indicated that lack of understanding and support among the community groups and leadership are key barriers to the effectiveness of climate change adaptation strategies (LGASA 2014). The report also emphasised the inadequacy of guiding documents, such as policies, due to a lack of knowledge and resources, and that a lack of strategic and coordinated approach has led to a weak governance of coastal SES in South Australia.

Resilience-based coastal governance, as suggested in this research, could potentially assist South Australian State Government to deal with the complexity of coastal SESs and integrate multiple stakeholders' interests in the process of coastal decision-making. For example, according to the proposed reform options, developing mechanisms for active public engagement and education could respond to the problem of lack of public awareness

and capacity to respond. Improved engagement processes could assist the NGOs and communities to develop a better understanding of the potential threats of climate change and sea level rise in South Australian coastal areas, how these threats can influence long-term benefit flows, and development of adaptive response strategies. Enhanced stakeholder awareness would potentially increase public engagement in implementing adaptation and transformation strategies and support achieving effective responses to coastal problems.

In addition, developing a reliable and valid knowledge system, as was advocated in Section 7.4, would potentially support the development of policy framework to respond South Australian coastal problems. Such a framework could support informed coastal leaders (especially in the Department of Environment, Water and Natural Resources) to develop adaptation strategies and programs. Finally, establishing a bridging panel that is responsible for coordinating coastal decision-making and policy development could improve state-wide organisational communication, collaboration and partnerships.

Garmestani and Benson (2013) applied a resilience-based assessment to evaluate environmental governance system in Florida Bay, US. Similar to this thesis, Garmestani and Benson (2013) argued that transition towards resilience-based coastal governance require strengthening panarchial relations, novelty and innovation, and organisational learning (Garmestani & Benson 2013). They concluded that without a “reflexive” legislation framework, that strengthens panarchial relation, achieving such a structure is not possible.

Developing a supportive legislation, policy and planning framework that reinforces panarchial relations and encourages resilience-based decision-making is a key reform strategy proposed in this research. This form of the framework should clarify power relations across scales and encourage polycentric coastal governance arrangements where the roles and responsibilities are fairly distributed across levels. For example, the reform options recommended developing a legislation or policy framework that acknowledges accountability, liability, and novelty at the local level. This recommendation could be useful in multi-level governance arrangements such as Florida Bay in the US.

Martino (2016) identified poor integration between the national and regional scales as a key issue in the Italian coastal governance system. Also, lack of a “uniform strategy” was recognised as the main barrier for a consistent coastal governance at the national level

(Martino 2016). According to the reform options suggested by this study, developing an overarching collaborative policy, where all influential organisations across levels could have their say, would facilitate achieving consistent decision-making and ongoing policy development. Also, developing reciprocal plans and programs to enhance the level of inter-sectoral and cross-level partnerships and strengthen panarchial relations would decrease fragmentation between levels of governance.

Furthermore, Hopkins et al. (2011) argue a Systems Approach Framework (SAF) deal with the complexity of coastal decision-making in Europe. This framework aims to facilitate a stronger science-policy interface by focusing on developing an improved knowledge system that is integrated into coastal governance (Hopkins et al. 2011). The proposed resilience-based coastal governance in Section 7.4, with the focus on communicative and integrative knowledge acquisition, management and sharing, could facilitate the development of such a framework. In addition, SAF requires feedback loops to generate information for monitoring and evaluation of its effectiveness in the policy development process (Hopkins et al. 2011). Developing and implementing an adaptive planning and management cycle, as was proposed in the reform options, could deliver the responsive feedbacks to support knowledge acquisition, learning and adaptive decision-making continuously.

Finally, the proposed resilience-based arrangement could potentially respond to "weak feedbacks and governance mismatches" in the decision-making and policy development process such as those between the jurisdictional legislative framework and public interests in the Southwest Nova Scotia lobster fishery (Barnett & Anderies 2014). In this case, governance mismatches have reduced the effectiveness of the responses and resulted in low public participation and deterioration of fishery resources.

Resilience-based governance and the proposed reform options could deliver effective responses to the problem of such governance mismatches (including scale mismatches regarding organisational roles and responsibilities) and public engagement deficiencies. The attention to a holistic and inclusive approach across scales, which is a key feature of the resilience thinking framework, could support inter-sectoral and cross-scale collaboration and communication, which could also potentially deliver more transparent decision-making. As was proposed in the reform option, developing a supportive legislation, policy and

planning framework that facilitates public engagement in the decision-making process could more effectively resolve conflicts and facilitate more collective decision-making and policy development.

7.7. Chapter Summary

This chapter discussed the findings of Chapters 3 to 6 regarding the current regime of coastal governance in Tasmania, the features of desirable resilience-based coastal governance arrangements, and a reform proposal to progress such arrangements. The chapter demonstrated the utility of the 16 attributes as a framework for analysing resilience capacity across the levels of Tasmanian coastal governance. In addition, the implications of the 16 attributes in developing resilience-based governance beyond the case study area were examined.

Furthermore, the power and utility of incorporation of resilience thinking in the Tasmanian coastal governance were argued. According to the results, resilience thinking framework is futuristic, holistic, entrepreneurial, and panarchial. The framework accounts for complexity and dynamics of coastal SES and can be inclusive of other approaches, interests and values. The analysis revealed that despite some attributes being more context depended than others, many could be utilised to guide the development of enhanced resilience capacity elsewhere.

The chapter discussed the consistencies and confusions in the definition of resilience thinking framework and its application in Tasmanian coastal governance. Although the preliminary interpretations of resilience capacity, within the case study participants, referred to system adaptability and recovery capacity, as the interviews progressed most of them agreed with the inclusion of transformability as a defining characteristic of resilience capacity.

The organisational capacity and the regime of attributes across the levels of Tasmanian coastal governance arrangement were analysed. According to the analysis, despite the highly important role of Tasmanian Governance in coastal governance, all the agencies at this level demonstrated low or no resilience capacity. The chapter progressed by proposing reform options to facilitate a transition towards a resilience-based Tasmanian coastal governance. The reforms were presented under the following themes: framework,

approaches and arrangements in coastal governance; intersectoral communication and collaboration, panarchy and adaptive cycle; incremental, constructive, and reformist development; informed leadership and proactive leadership support; knowledge system and adaptive learning; public awareness and engagement mechanisms.

Finally, the potential of the proposed reforms to respond the coastal governance problems beyond the case study area was considered. In this respect, the utility of the resilience thinking framework, resilience-based coastal governance and the proposed reform options to respond to the coastal problems were indicated for other coastal areas across Australia and internationally. According to the analysis, the proposed reform options could be beneficial to deal with problems related to SES complexity and scale mismatches in other Australian states, the US and Europe.

Chapter 8. **Conclusion**

This chapter summarises the key findings of this research as they relate to the aim and objectives in chapter one (Section 1.3). The chapter indicates how each of the research objectives was approached and addressed during the study. The significance, contributions and implications of this thesis are summarised. Finally, opportunities and requirements for further research are identified.

8.1. Addressing the research objectives

The aim of this research was to inform the development of a resilience-based coastal governance arrangement that accounts for the complex and uncertain dynamics of Tasmanian coastal SES. This form of coastal governance is likely to enhance capacity for addressing and responding to both incremental and rapid environmental and social drivers of change. To guide achievement of the aim, six objectives were identified, and a series of methodological steps were implemented to accomplish each objective. This section summarises the processes and outcomes in relation to each objective.

Objective 1: To establish requirements for an effective and responsive coastal governance arrangement, as informed by resilience thinking, governance theory and multi-level interactions between coastal actors

The research analysed the drawbacks, complications and misapplications of the conventional approaches in environmental and natural resource management such as sustainability, risk management, the precautionary principle, EBM and adaptive management. The analysis revealed that part of the problem is due to unresponsiveness of each individual approach to SES complexities and social and environmental drivers of uncertainty. Scholars argue that conventional environmental management approaches are partial, fragmented, hierarchical, command and control and prescriptive (Benson & Craig 2014; Walker & Salt 2006).

Researchers indicate the failures of management paradigms to address social attributes and embrace a wider range of stakeholders values and interests (Levin 1998). Scholars argue that management-based decision-making dominated by technocratic attitudes mainly considers scientific and technological solutions for complex coastal issues (Berwick 2007;

Hopkins et al. 2011). In this respect, researchers emphasise the requirement for a framework that is responsive to human interests as well as natural values, while facilitating institutional collaboration across temporal and spatial dimensions (Duxbury & Dickinson 2007; Hopkins et al. 2011; Nobre 2011).

To respond to this requirement, after conducting an extensive literature review, resilience thinking (and the embedded concept of an SES) was identified as a potentially suitable framework to address the complexity of coastal SES under conditions of uncertainty. In addition, governance was recognised as providing an essential means of identifying and negotiating diverse values and interests, including ecological, social, economic and political considerations. By integrating these two notions (resilience thinking and governance), the idea of resilience-based coastal governance was put forward as a potential useful response to deal with Tasmanian coastal problems.

Resilience-based governance is a type of governance arrangement that adopts resilience thinking as the main framework for guiding governance design and associated approaches to decision-making and policy development. Such an arrangement is holistic and involves collaboratively developed responses to sustaining benefits and minimising the loss of social and natural values. Resilience-based governance addresses the dynamics and complexities of coastal SESs, is not risk-averse, acknowledges both incremental and radical changes and uncertainties, and supports both adaptational and transformational decisions. Also, resilience-based governance is panarchial and accounts for a hybrid regime of top-down and bottom-up distribution of powers and allocation of roles and responsibilities.

Objective 2: To identify influential organisations, taking into account the interactions across scales

The process of identifying influential organisations, and the mechanisms through which they exert influence, took place using literature review, a survey and key informant interviews (Chapters 4 to 6). First, the potential influential organisations were identified through the review and analysis of the relevant documents. Then, the likely instruments and mechanisms that organisations could potentially use to influence coastal governance were identified through a stakeholder survey, including legislation and other mechanisms such as

policies, agreements and strategies. Finally, interviews were conducted to validate and add to the results of the desktop analysis and survey.

According to the results of Chapters 4 to 6, a number of organisations, at multiple scales of governance, were identified to having some degree of influence on Tasmanian coastal governance, including departments and agencies of the Australian and Tasmanian Governments, regional NRM bodies, local councils, private industries (such as tourism and fish farming businesses) NGOs and community groups. In addition, the analysis indicated that the mechanisms of influence vary from one organisation and from one governance level to another.

For example, while the Australian Government was indicated to have a major leadership role to fund and support research and implementation programs, the Tasmanian Government were more influential in developing legislative frameworks, policy/strategy advice and managing knowledge systems. Local councils' influence mainly originates from delegation by State Government of local land use planning responsibilities under *LUPAA 1993*. In addition, local councils were influential through their role in coastal day-to-day management. Generally, the Tasmanian Government and local councils were identified as the most influential bodies in coastal governance.

Objective 3: To evaluate the resilience capacity (both adaptational and transformational) of the case study coastal governance system, identify its attributes, analyse its features and identify its strengths, weaknesses and barriers to improvement

The results of the literature review (Chapter 3) identified 16 key attributes that constitute resilience capacity, and which could inform resilience-based governance arrangements for Tasmanian coastal areas. These attributes included mechanisms for knowledge acquisition, knowledge management processes, knowledge sharing mechanisms, diversity of expertise, institutional flexibility, institutional learning, leadership for change, leadership for securing outcomes, transparent decision-making processes, stakeholder engagement processes, conflict resolution mechanisms, institutional partnerships, supportive legislation, institutional connectedness and coordination, distribution of power, and adaptive planning and management cycle. The attributes encompassed the fundamental features of resilience thinking and good governance criteria including: panarchy, adaptive cycle, stakeholder

engagement, flexibility, polycentricity, leadership and adaptive planning and adaptive management.

The regime of current Tasmanian coastal governance regime was assessed against these 16 attributes reviewing the documents relevant to the case study coastal governance, a stakeholder survey and key informant interviews. Although interview participants were not directly questioned about the relative importance of each attribute, indirect evidence was provided by the interview participants in the context of identifying requirements for resilience-based governance.

According to the survey results, 14 attributes were indicated to have a significant importance (important and highly important average values) in developing resilience-based governance. Only two attributes were considered by survey participants to be of moderate importance: distribution of power between Australian Government and regional NRM bodies, and between the Tasmanian Government and regional NRM bodies. The results of the evaluation showed a low level of resilience capacity across the entire Tasmanian governance system. At the Federal level, only three of the attributes were in the 'marginally supportive' category: knowledge management processes, diversity of expertise and knowledge sharing mechanisms. The rest of the attributes were not sufficiently well developed in Federal governance arrangements to support any level of resilience capacity.

For Tasmanian Government agencies, DPIPWE was found to have a better resilience capacity than DPAC and TPC. However, even DPIPWE only had three attributes at a level of development to support a marginal resilience capacity: knowledge management processes, diversity of expertise, knowledge sharing mechanisms. At DPAC, as the main coastal policy-making organisation, performance against all the attributes was at a low-level. Leadership for change, adaptive planning and management cycle, institutional flexibility and supportive legislation framework were found at a critically low capacity at Federal and State levels.

Inter-organisational attributes such as organisational coordination, cooperation and partnerships between Tasmanian Government and other stakeholders (including local councils, NGOs and community groups) also required significant improvement. NRM South and Clarence and Kingborough councils were found in a better position. In this respect, NRM South had nine attributes supporting an adequate resilience capacity: leadership for change,

knowledge acquisition mechanism, organisational learning, transparent decision-making processes, stakeholder engagement processes, leadership for securing outcomes, knowledge sharing mechanisms, organisational flexibility, diversity of expertise. Adaptive planning and management cycle, conflict resolution mechanisms, and knowledge management processes were in a marginal situation.

On a local scale, the results revealed two levels of resilience capacity at the three case study councils. Resilience capacity at Clarence and Kingborough Councils were almost similar. At these two councils all the attributes were supporting at least a marginal level of organisational resilience. However, Huon Valley Council were not supportive of any degree of organisational resilience against any of the attributes.

Finally, the results of Chapter 6 identified the barriers to establishing a resilience-based Tasmanian coastal governance or improving its resilience capacity. As was indicated by the interview participants, lack of supportive political leadership, as well as unavailability of a responsive policy, strategy and planning framework (such as an effective and implementable TSCP), were the major barriers to developing a resilience-based coastal governance. Lack of financial and human resources, fragmented decision-making, policy development and planning system, and inappropriate inter-sectoral and cross-scale communication and collaboration between coastal stakeholders were other important barriers.

Objective 4: To reflect on the power and the utility of resilience thinking for informing the design of an effective and responsive coastal governance regime

This objective was examined through an extensive review of the literature followed by key informant interviews. According to the literature, a resilience thinking framework could deliver a better understanding of the complexity and dynamics of coastal SESs (Folke et al. 2010; Walker & Salt 2012). The notions of adaptational and transformational capacities (embedded in the resilience thinking framework) would encourage and facilitate the state of preparedness in dealing with both incremental and radical changes (Armitage & Plummer 2010; Kates et al. 2012).

The findings of the interview analysis confirmed the power and the utility of resilience thinking framework for Tasmanian coastal governance. The participants indicated that resilience thinking framework could deliver the appropriate level of holistic and multi-scalar approaches that are required for effective and responsive coastal governance. The idea of panarchy can facilitate multi-level and cross-scale coastal governance. In addition, a resilience thinking framework could deliver a better understanding of coastal SES complexity. Finally, it was indicated that resilience thinking could assist responses to the problem of scale mismatches between State-level coastal policy-making and local scale coastal management activities.

In this regard, the review of the literature revealed that a resilience-based coastal governance arrangement is futuristic and forward-looking rather than orthodox and conformist; holistic and inclusive rather than partial and comprehensive; collaborative and communicative rather than competitive and fragmented; flexible and innovative rather than rigid and prescriptive, complex and dynamic rather than simplistic and static; panarchial and polycentric rather than hierarchical and centralised; and proactive and entrepreneurial rather than reactive and risk-averse (Davoudi 2016; Fazey 2010; Folke et al. 2010; Walker & Salt 2012; Walker & Salt 2006).

Objective 5: To develop and assess potentially useful reform options that inform the development of coastal governance arrangements that are likely to enhance resilience capacity of the case study governance system

Following analysis of the survey and interview data, a series of reform options were proposed to inform the development of a desirable resilience-based Tasmanian coastal governance. The reform options were proposed taking account of the weaknesses, strengths, threats and opportunities of the current Tasmanian coastal governance regime. A reformist approach was adopted in the recommendation of the options, insofar as they built on rather than replace the current arrangements, as per (Clement et al. 2015).

The reform options were structured under six interrelated themes, each addressing a particular aspect of resilience-based governance: governance framework/ approaches; panarchy and adaptive cycle; slow, incremental, reformist and constructivist nature of

coastal governance; leadership; knowledge system and adaptive learning; and public awareness and engagement.

Objective 6: To draw out implications for the design of resilience coastal governance regimes beyond the selected case study area

Finally, the potential implications and benefits of the proposed arrangements and associated reform options were considered in relation to coastal areas beyond the case study that was the focus of this thesis, as well as the applicability of resilience-based governance to non-coastal areas. Examples were provided where the proposed resilience-based governance could potentially respond to the complexities of coastal decision-making and policy development at the national and state/territory levels in Australia. Suggested applications of resilience-based governance in other parts of the world (mostly developed countries) were also offered as a means to address wicked coastal problems and develop effective responses.

In this regard, the research argued that despite the fact that some characteristics of SESs vary from one place to another, the attributes developed in this study are mostly context independent. As a result, the same attributes could inform the analysis and development of a resilience-based governance in other geographical locations. Furthermore, based on a comparison between the Tasmanian coastal SES and issues facing coastal areas in the US and Europe, it is likely that many of the reform options proposed in this research could be addressed governance problems in other developed country contexts. For instance, a resilience-based coastal governance, where a holistic and inclusive approach could facilitate a collaborative and communicative decision-making and policy development, would respond to the problem of lack of a "uniform strategy" and scale mismatches in Italian coastal governance (Martino 2016).

8.2. Contributions and implications for resilience thinking and coastal governance

This section summarises the s theoretical and conceptual contributions of this research to the resilience thinking literature and the practical implications for the design of coastal governance systems.

Theoretical contributions

This research contributes to clarifying elements of resilience thinking and associated terminology in two ways. First, the research consistently refers to a 'resilience thinking framework', defined as an overarching frame of mind and a 'higher order of thinking' (Benson & Craig 2014; Fazey 2010; Walker & Salt 2006). This is in contrast to common understandings of resilience concept from the literature that describe it as a property of a system (either measurable or non-measurable) or capacity (ability) to be 'resilient' (Carpenter et al. 2001; Rockström et al. 2014). Rather than focusing on creating a resilient product, the 'resilience thinking framework' targets the systems and the mechanisms that constitute the process of decision-making, policy development, planning and management. So, a resilience-based governance is a form of arrangement that has an appropriate capacity that facilitates and encourage the application of resilience thinking framework. This capacity is called 'resilience capacity', which addresses a state of 'thinking-resilience' rather than 'being-resilient'.

Second, the semantic and terminological considerations offered in the thesis are other contribution to the resilience literature. For example, this research adopted the term resilience-based governance to describe an arrangement that adopts resilience thinking as the main framework for coastal decision-making and policy development. This form of arrangement is adaptive, flexible and can actively reorganise according to the internal and external drivers of change. According to definitions given in this study, the underpinnings of resilience-based governance are similar to adaptive governance, which has been extensively used in the resilience literature (Chaffin et al. 2014; Folke 2007; Olsson et al. 2006).

In the last few decades, much of the adaptive capacity literature has been developed in the context of climate change adaption. As the findings of the study (particularly in Chapter 6) highlighted, there was a considerable confusion, both in the literature and amongst case study participants, regarding the differences between adaptation capacity as the ability to adapt; and adaptive capacity (or adaptiveness), as the capacity to adapt and transform. So, the research found that the utilising the term 'adaptive governance' might indirectly result in an emphasis on adaptability and thereby undermine attention to transformability. Hence,

the research advocated a shift from the conventional terminology of “adaptive capacity” to ‘resilience-based governance’.

Garmestani and Benson (2013) were the first to adopt the term “resilience-based governance”. They adopted the term to indicate a mode of governance that is capable of delivering resilience-based solutions to complex environmental problems. Using some of the notions of resilience (such as adaptive cycle and panarchy), Garmestani and Benson (2013) provided some general requirements establish such a structure. However, regarding particular attributes, the focus of their research was only on the need for ‘reflexive laws’. This research extended the Garmestani and Benson (2013) work by further scrutinising its theoretical foundations and developing a more comprehensive set of analytical attributes that contribute to the development of a resilience-based governance structure.

Practical implications

This study is the first to apply a resilience thinking framework to Tasmanian coastal governance. This thesis recommended the application of an original resilience thinking framework as an overarching means of analysing coastal governance and establishing a direction for reform. Also, the study suggested a revised approach to risk management in response to the problems of scale mismatches in coastal decision-making and policy development. In the proposed regime of governance, while resilience thinking deals with higher-level policy issues, risk management responds to local scale management problems.

Furthermore, despite the dominant interpretation amongst case study participants, resilience thinking framework goes beyond maintaining a systems functions and structure. Practical implications of the framework also allow for the development of adaptation, emergency and recovery responses. Resilience thinking accounts for fundamental changes, transformability and the capacity to create new trajectories for system development. These notions challenge the currently prevailing risk-averse and efficiency based governance approaches. Conversely, it encourages the incorporation of an entrepreneurial attitude to coastal governance. Considering transformation capacity in both assessing and recommending improvements for Tasmanian coastal governance was an innovative element of the study.

8.3. Recommendations for further research

With the rapid growth of resilience literature over the last decade, resilience and associated concepts have become 'buzz words' in environmental and social research. However, as a still-emergent field of academic endeavour, more work is needed to resolve basic issues of conceptualization, interpretation and application. This section outlines potential theoretical and applied research opportunities in this area.

Theoretical research opportunities

Resilience thinking and its associated concepts (such as adaptive cycle, panarchy and SES framework) are complex in nature. The findings of this research revealed considerable confusion in the understanding of its theoretical, ontological and epistemological underpinnings. Further research should clarify its theoretical notions and develop a shared understanding through hermeneutical methodology. A hermeneutical methodology raises the idea scrutinising and uncovering the theoretical underpinnings of resilience thinking framework through constant researching, discussion and communication to achieve a broader consensus about the definitions. Such theoretical investigations should seek to illuminate the diverse elements of resilience and inform its utility in multiple fields of research.

Another major area of theoretical research need is the study of transformability and transformational capacity. While the concept of adaptability has been broadly studied both in vulnerability and resilience scholarship (specifically in climate change research), transformation and transformability have received much less attention (Cork 2010; Kates et al. 2012; Pelling 2010; Walker et al. 2006). The increasing frequency and recurrence of radical changes and their severe impacts on coastal SESs highlight the necessity for a much better understanding of system transformability and transformative governance (Chaffin et al. 2016).

Potential studies could focus on different forms of transformability, including deliberate and forced transformation. Such research could also clarify potential approaches to the application of transformability, and in particular, identify the attributes and requirements for developing transformational capacity. Divergences and convergences between adaptability of a system and its transformability are another potential focus for research.

The results of the thesis revealed confusion about the relative contributions of the 16 resilience attributes to improving transformability of the systems, and how transformability can be distinguished from adaptability.

Applied research opportunities

This research provided an analysis of the regime associated with resilience capacity in Tasmanian coastal governance. According to the findings, further detailed studies are needed to evaluate the attributes of resilience capacity in each organisation across Tasmanian governance levels. Such research requires a scrutiny of resilience capacity attributes in organisations according to influence, roles and responsibilities. This in-depth examination would strengthen the ability of researchers to formulate organisation and system level interventions and reforms directed towards enhanced resilience-based governance.

As noted above, the recommendations of this study for development of a resilience-based coastal governance are not definitive. Further research is needed to determine the suitability and applicability of the proposed structures and reform options in the context of ongoing dynamic change in Tasmanian coastal SESs. In the spirit of adaptive approaches to governance reform and policy-making, such assessments need to be iterative over several sequences of implementation, review and adjustment.

8.4. Final remarks

Courtney Stevens (2015) in her book “The Lies About Truth” says: “If nothing changes, nothing changes. If you keep doing what you're doing, you're going to keep getting what you're getting. You want change, make some”. This thesis was about understanding and responding to change. The research challenged the dominant risk-averse approach to environmental decision-making and policy development. It argued the requirements for moving beyond scientific and technocratic paradigms in environmental decision-making and incorporating social and ethical concerns such as equity, democracy, transparency and collaborative leadership.

The research focused on the resilience of coastal SES and complex decision-making under environmental uncertainty. It aimed to inform the development of an effective and

responsive form of coastal governance that can think fast and slow (Kahneman 2011) to deal with adaptational and transformational changes. In this regard, the study proposed a resilience-based coastal governance, identified the required attributes, and recommended reform options to inform its development.

The findings of the thesis are not an endpoint. I do not claim that the findings of this thesis solve Tasmanian coastal problems in a prescriptive fashion. I argue that the research provides general insights and recommendations to tackle Tasmania's wicked coastal problem, taking into consideration associated social and ecological complexities. Implementation of resilience-based Tasmanian coastal governance requires collective efforts between all relevant organisations across scales of governance ranging from Australian Federal Government to local community groups. As Lao Tzu said: "a journey of a thousand miles begins with a single step". The research is only one step forward.

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Appendices

Appendix1: Survey questionnaire

Resilience in Tasmanian Coastal Governance

Tasmania's coastal zone is facing multiple pressures from residential developments, climate change, agricultural and forestry activities in the catchments and so on. The overall impact of these changes is uncertain, so it is difficult to identify long-term strategies that are likely to maintain or enhance important coastal values. In this context, it is important that governance arrangements are responsive to changing circumstances, and are able to support the resilience of coastal communities and environments.

Depending on the circumstances, governance that fosters resilience may need to maintain important values through adaptive responses to change, or minimise the loss of value and identify new opportunities arising from system transformation. This survey comprises 16 sets of questions. Each question set addresses a particular attribute that may foster resilience of Tasmanian coastal governance.

Please note that there are no right or wrong answer. For each row in each question set, please tick one box which is **closest** to your opinion. The organisations in each question have been chosen because of their governance roles for Tasmanian coastal areas as a whole, and for 3 case study local government areas within Tasmania.

1. Mechanisms for knowledge acquisition

Mechanisms to collect or generate knowledge from a range of disciplines and sources, including scientific, political, economic, social, cultural, traditional and local knowledge

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate is the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

2. Knowledge management processes

Processes that store and deliver knowledge, while controlling its quality and ensuring its currency

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

3. Knowledge sharing mechanisms

3. Mechanisms that ensure knowledge is shared with other actors

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

4. Diversity of expertise

Availability of personnel skilled in environmental, social and economic matters of relevance to the coastal zone

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

5. Institutional flexibility

Ability of organisational structures and processes to change in response to changing internal or external conditions

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

6. Institutional learning

The capacity of the institution to learn from their own previous experiences and those of others, as well as from consideration of plausible futures, challenges and response options

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
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Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

7. Leadership for change

Leadership on coastal issues that promotes innovation and identifies strategies that take advantage of new opportunities

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
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Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

8. Leadership for securing outcomes

Leadership that works to secure wide political and community support for coastal management strategies, and resources to implement these strategies

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

9. Transparent decision-making processes

Decision-making processes for coastal issues that allow stakeholders to see what decisions are being made, as well as the rationales for these decisions

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

10. Stakeholder engagement processes

Engagement processes for coastal issues that use appropriate methods to allow and encourage all stakeholders to contribute to decision making

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

11. Conflict resolution mechanisms

Mechanisms that provide effective means to address conflicts within the organisation, and with external stakeholders

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

12. Institutional Partnerships

Collaborative arrangements with other governance authorities and stakeholder organisations that address coastal issues

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

13. Institutional connectedness and coordination

Processes and agreements that foster connections and coordination across multiple levels and scales of coastal governance

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

14. Supportive legislation

Legislation relevant to the coast that establishes goals, processes and standards while allowing flexibility to respond to change

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government						
Tasmanian Government						

15. Distribution of power

Arrangements that distribute power across multiple levels and scales of coastal governance

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

16. Adaptive planning and management cycle

Processes that set measurable objectives, identify and implement strategies to achieve these objectives, monitor outcomes, adjust knowledge based on evidence from monitoring, and foster improved performance over time

What is the importance of the attribute for each level of governance?	Not Important	Somewhat Important	Moderately Important	Important	Very Important	Don't Know
Australian Government						
Tasmanian Government						
Regional NRM organisations						
Local Governments						

How adequate in the performance of each of the following organisations in relation to this attribute?	Very Poor	Poor	Fair	Good	Very Good	Don't Know
Australian Government Department of Environment						
Tasmanian Government Department of Premier and Cabinet						
Tasmanian Government Department of Primary Industries, Parks, Water & Environment						
Tasmanian Planning Commission						
NRM South						
Clarence Council						
Huon Valley Council						
Kingborough Council						

Appendix2. Interview questions

Governance for the resilience of Tasmanian coastal systems

Interview Questions

Part 1. Tasmania's coastal systems

1. Which organisation(s) do you think have more influence over Tasmanian coastal governance? How?

2. What are the main threats (environmental, social, political, economic …) that are currently affecting Tasmania's coastal systems?

3. What are the main opportunities (Environmental, social, political economic) to improve the ecological, social and/or economic values associated with Tasmanian coastal systems?

Part 2. Adaptation capacity

By adaptation capacity I mean the extent to which the governance arrangements are able to respond to threats and opportunities so that the values of current Tasmanian coastal systems are maintained or enhanced.

4. What does adaptation capacity in coastal governance mean to you?

5. Which of the threats and opportunities you identified earlier particularly require adaptation strategies?

6. How well-placed are the current governance arrangements to provide the necessary adaptation capacity? (Or how do you evaluate its adaptation capacity?)
    - Which attributes of the governance system, if any, support adaptation response strategies? Which attributes of the governance system, if any, ignore the need for or hinder adaptation response strategies?

7. Do you have any suggestions for how the adaptation capacity of Tasmania's coastal governance could be improved? Which attributes in particular could be targeted for improvement?

Part 3. Transformation capacity

8. Do you think that transformation of the Tasmanian coastal system could plausibly occur in the future (let's say over the next 50 years)? If so, what environmental, social and/or economic factors might drive such transformation?

9. How well-placed are the current governance arrangements to deal with such transformation? Which parts of the governance system, if any, might support appropriate response strategies? Which parts of the governance system, if any, ignore the need for or might hinder appropriate response strategies?

10. Do you have any suggestions for how the capacity of Tasmania's coastal governance to deal with system transformation could be improved?

11. In documents related to the coastal governance, within all levels and scales, (i.e. SOER the State coastal policy, coastal work manual (DPIPWE), etc.) There are several addresses for enhancing the resilience of coastal systems; what does it mean and what can you suggest enhancing that resilience?

Part 4. Risk management or resilience?

12. Regarding uncertainty of the Environment and complexity of the Social Ecological Systems in one hand and the need for enhancing both adaptation and transformation capacities of the coastal governance, which approach do you think can deliver a more effective response? What are the pros and cons of each approach? Are there other approaches that you would recommend?

13. Do you have anything else that you would like to add?

Thank you very much for your participation in this interview

Appendix3. Interview information card

Coastal governance

The processes of collaborative democratic decision-making, policy development, planning and management that influence Tasmania's coastal systems

Tasmania's coastal system

Ecological, social, economic and governance components relevant to the Tasmania's coast, and the interactions between them

Resilience

Extent to which a system can absorb change, regenerate and maintain its function

Adaptation capacity

Extent to which governance arrangements respond to threats and opportunities so that the values of current Tasmanian coastal systems are maintained or enhanced

Transformation capacity

Extent to which governance arrangements respond to threats and opportunities associated with transformed Tasmanian coastal systems with minimum loss of value and effective generation of new value

Risk management approach

Typically involves identifying key sources of risk and attempting to mitigate these risks

Resilience thinking framework

Seeks to maintain or enhance the capacity of the system to remain in a beneficial state